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DEVELOPMENT OF THE NEWSPRINT INDUSTRY IN TEXAS

By

WAYNE F. MCCARTY

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condition to prevail, the equation

$$\frac{X_c}{R} << 1$$

must be true at the frequency under consideration. This condition is easily satisfied by making the RC time constant of the circuit large. Fig. 7 clearly shows, however, that the amplitude of the output voltage is made smaller as the RC product is increased. If a band of frequencies are to be passed by the integrator, other factors must be taken into consideration. These factors are discussed in PART IV.

As in the case of the differentiator circuit, the positive and negative portions of the cyclic input voltage may be on unequal duration. Under these conditions, the integrator circuit is useful in the determination of pulse length, the integrator output being proportional to the area of the rectangular voltage input. The integrator when followed by a clipper circuit, can be used as a delay mechanism. No output from the clipper will result until the integrator output voltage has risen above the threshold of the clipper.

5. THE PULSE AMPLIFIER-NEGATIVE PULSE INPUT

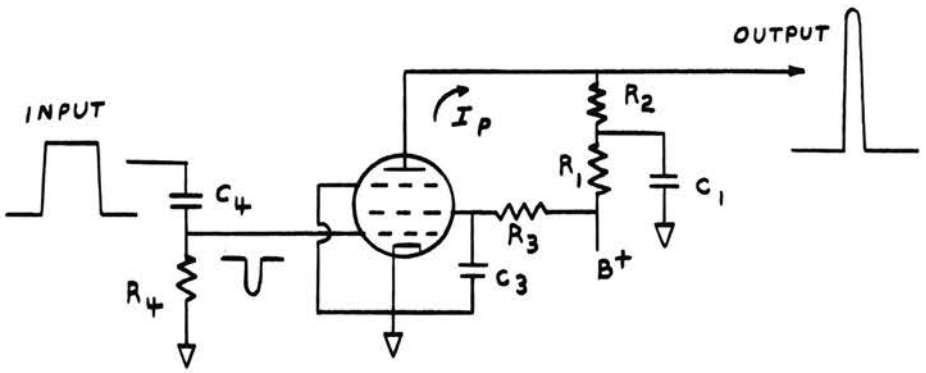

FIG. 8

DEVELOPMENT OF THE NEWSPRINT INDUSTRY IN TEXAS

WAYNE F. MCCARTY

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THESIS AND ABSTRACT APPROVED:

David C. Winslow
Thesis Adviser

Edward E. Kesse
Faculty Representative

D. C. McTurlock
Dean of the Graduate School

PREFACE

While employed at the Ponca City News, Ponca City, Oklahoma, the writer became interested in the newspaper business. It was while working in the press-room in 1940 that he came in contact with his first Southern newsprint. At that time it seemed much more practical to use newsprint made in Texas than to import it from Canada. One can readily recognize the importance of the news-print industry to the dissemination of knowledge throughout the world. The newspapers of the United States are one of the primary mediums by which information is transmitted to the people. Also of extreme importance is the role which newsprint may play in the future development of the South. Realizing the importance of newsprint both as a medium of transferring knowledge and as an industrial development for the South, the writer embarked upon a study of the newsprint industry in Texas.

The purpose of this thesis is to give a geographic interpretation of the newsprint industry, emphasizing the new development in the use of yellow pine as a raw material for the manufacture of woodpulp in the South. The Southland Paper Mills, Incorporated, is treated in full because at the present time it is the only newsprint mill in the South of a proven commercial nature. The study also necessitated an extensive introduction into the history and early development of writing and printing papers and the evolution of newsprint itself. The manufacture of mechanical and chemical pulp, the major materials used in the fabrication of newsprint, are also discussed.

Principal sources for the material of this thesis were from field studies made by the writer. It was possible for him to make only one trip to the Southland Mills, Lufkin, Texas, but this reconnaissance survey covered a period of one week. He was able to observe all the manufacturing processes in operation and to have personal interviews with many of the plant employees. Of prime

importance was the cooperation extended by the Lufkin office of the Perkins-Goodwin Company of New York. The representatives of both the Southland Mills and the Perkins-Goodwin Company were very cooperative in contributing information for this study. Other source material includes; paper trade journals, special reports of the Southland Mills and the Perkins-Goodwin Company and a limited amount of correspondence with the afore mentioned companies. Secondary sources used were books concerning the history and development of paper.

The writer wishes to extend his gratitude for valuable information concerning the manufacture, distribution and general information about Southland especially to Mr. Lloyd G. Schenck, Manager, Lufkin Office of Perkins-Goodwin Company; Mr. C. C. Porter, Assistant to the Manager, Southland Paper Mills; Mr. R. C. Winson, Salesman, Lufkin office of the Perkins-Goodwin Company; Mr. Cary Trevathan, Assistant Manager, Lufkin office of the Perkins-Goodwin Company and to Mr. Robert Hamner, Backtender, Southland Paper Mills. The writer also wishes to acknowledge the help received from Mr. Clyde E. Muchmore, Editor of the Ponca City News, Ponca City, Oklahoma, whose assistance was instrumental in making contact with the Southland Paper Mills.

The writer is indebted to the Faculty of the Geography Department and especially to Dr. David C. Winslow, Assistant Professor Geography, under whose patient direction this study was made; and to Dr. E. E. Keso, Head of the Geography Department, for valuable suggestions and assistance in the preparation of this thesis.

W. F. M.

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CHAPTER I

EARLY HISTORY OF WRITING MATERIALS

Most inventions and improvements of importance have grown out of a recognized need of some kind. And so it was with primitive man as he emerged from his long journey through unrecorded history. The old methods of verbal transmission and rock monuments proving alone unsatisfactory for communication, he sought more accurate means of keeping alive the progress of the day. Some of the early materials used by man to record his ideas and history were stone, clay, metal, bone, ivory, wood, wood covered with wax, and leaves and bark of trees. Clay was probably the most important material used by the ancients for many of the purposes for which we use paper today. The history of such once flourishing nations as Chaldea, Babylonia, and Assyria has been handed down to us through the medium of clay tablets.[1]

Much information was transmitted in these ways, but it was costly and insufficient. These materials were not of a satisfactory nature which led to experiment and discovery of papyrus, the use of this material starting the era of papermaking. Papyrus, along with parchment, are considered as the direct forerunners of modern paper. In fact, paper takes its name from the papyrus plant. Papyrus or Biblos, as it was sometimes called, was used by the Egyptians and early Greeks. The use of papyrus can be traced as far back as 3600 B.C. Many documents recorded on papyrus are still in existence

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1 Mary E. Wheelock, Paper: Its History and Development, p. 3.
Harry E. Weston, A Book on Paper, pp. 1-2.

today. The papyrus medium was made in the form of sheets and rolls. The rolls ravied considerably in length, but the width was somewhat standardized. Typical was The Theban Book of the Dead which consists of a roll 122 feet long and 21½ inches wide.[2] The ancient method of making the papyrus sheets or rolls was as follows:[3]

> The pith from inside the stem of the plant was cut into thin long strips, which were laid side by side. These were made to the required size and gummed over with an adhesive, originally believed to consist of a viscous solution obtained from the River Nile, but now held to have been some form of prepared agglutinant. (However uncertain this may be as regards the Egyptian method, it is certain that the Romans used flour in the later manufacture of their highest quality papyrus.) Across this first layer of gummed strips was placed another layer at right angles. The sheet was then pressed and dried under the influence of the sun, following which it was polished by means of a bone, tooth, or hard stone. This polishing was not performed to obtain finish only, but also to help the material to resist the penetration of the inscribing fluid or pigment.

Papyrus was used as a writing material down to the middle of the tenth century A.D. However, after the Saracens had captured Egypt other materials were sought to use in papermaking, as the conquest had disrupted Mediterranean commerce and the demand had always exceeded the limited supply of papyrus anyway.

Some of the substitutes which were utilized were corn husks and stalks, hemp, cotton, wool, gutta percha, refuse tan bark after it had been used for tanning leather, hops, banana tree, aloe and spartum or esparto grass as it was later called. After this, parchment was used. It was usually made from the skin of sheep or goats. However, they have in the Sorbonne in Paris, a manuscript written on a human skin and also a copy of the Bible believed

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2 Harry A. Maddox, Paper: Its History, Sources and Manufacture, p. 3.

3 Ibid., p. 2.

have been written on the skin of a woman.[4]

The Chinese are credited with the discovery of paper as we know of it. They were the first to reduce fibrous material to a pulp and form the sheets of paper from the pulp. Previously materials used had not been reduced to a pulp. Ts'ai Lun seems to be the unanimous choice for the inventor of paper. However, there seems to be a discrepancy as to just when he made the discovery. The most commonly accepted time is 105 A.D. It was then, tradition records it, that he brought his invention to the attention of the emporer.[5]

The first paper made in China was probably composed of disintegrated cloth, but it was not long before the bark of trees and other vegetable materials were used. Mulberry wood, hemp fiber, and China Grass were used as papermaking materials previous to the third century A.D. So far as is known, the earliest dated piece of paper is a piece found at Lou-Lan in the Tarim Basin. This particular piece bears the date of 264 A.D.

The oldest paper documents, which are known to us today, are some Buddhist books dating back to the second and third centuries. They are in possession of a British museum.[6] Excavations in the central Asiatic desert have given us paper which is at least 1,000 years older than any known in Europe. It was in the areas along the old silk route that the archeologists made these discoveries. Some of the dates and writings on these papers are still legible.[7] In 1907 a walled-up library of a Buddhist cave temple was

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4 Wheelock, op. cit., p. 4.

5 Dard Hunter, Papermaking: The History and Technique of an Ancient Craft, pp. 48-56.

6 Andre Blum, On the Origin of Paper, p. 17.

7 "Earliest Paper and Books." Science Digest, (November 1940), p. 16.

discovered in the western Chinese province of Kansu. This library yielded the oldest known printed books, which bore the date of 868 A.D.

The Chinese guarded their knowledge of papermaking as a secret for several centuries. When the Arabs swept down upon Samarkand in 704 A.D., they captured some of the Chinese papermakers and then the secret that had been guarded for so long was made known to other peoples. However, there was some time lag between this event and the use of papermaking among the Arabs which was fostered by them in the year 751 A.D.[8]

The Moors modified the process which they had captured from the Chinese. The process as was originally used by the Chinese was one of ground or macerated wood particles while the Moors improved the quality by making their paper predominantly from old rags. The primary component of these rags was linen. From the year 792 A.D. till around 1850, about the only materials of importance used in the manufacture of paper were cotton and linen rags.[9]

The Moors being in supreme command of the whole of the Southern Mediterranean Basin, the knowledge of papermaking was transmitted from east to west through the areas that they had subjugated. By the year 900 A.D. the art of papermaking had arrived in Egypt. From here it spread along the African coast to Morocco. Papermaking was widely practiced in Morocco about 1100 A.D.[10]

From this point on there seems to be some disagreement as to how papermaking spread to Europe. Most of the authors seem to agree upon the theory that papermaking spread from Morocco across the Strait of Gibralter to Spain.

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8 Weston, op. cit., pp. 8-9.

9 Ibid., p. 9.

10 Dard Hunter, Papermaking Through Eighteen Centuries, p. 109.

However, some say that the method passed through Sicily. During the time of the Crusades, culture of the Saracens was being transmitted to the West and it seems highly probable that Sicily was the channel through which a knowledge of papermaking reached Europe.[11] At any rate, the general movement was from China to the Saracen nations and from there to Southern Europe. It seems logical, however, to believe that not all of the papermaking information was obtained from the Moors or Saracens as a result of their passing on their ideas voluntarily.

At the time of the Crusades, Western Europe was sending thousands upon thousands of men to the Near East to do battle with the Saracen. It does not seem plausible that all of those who returned home did so without absorbing some of the technology they had seen in practice in such places as Palestine, Syria and Egypt. Of especial interest should be the things and methods that the Western world were not using at that time. Papermaking could have been introduced or promulgated by those who returned home.

Whether through Spain or through Sicily, the art of papermaking was next introduced into France. The first paper manufacture was done at Herault, France in the year 1189. The Italians had gained papermaking knowledge shortly before the Germans and it is recorded that paper was manufactured at Montefano as early as 1276. A short time later paper was made in Venice.[12]

From there it was but a short step to Germany where paper was made by the year 1320. The Stromer mill, which was set up by Ullman Stromer at Nurnberg about 1390, was one of the earliest mills in Germany. Prior to his papermaking activities, Stromer had been a merchant, and it was on his trading

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11 Richard A. Newhall, The Crusades, p. 99.

12 William Bond Wheelwright, Printing Papers, p. 3.

journeys to Italy that he first saw paper being made. He was certain he could make a successful business venture of the paper trade in Germany if he could get a monopoly on its manufacture. Stromer was forced to procure his artisans elsewhere, because no one in Germany was versed in the art. After some deliberation he was successful in inducing some workers to come from Lombardy in Italy. Stromer, it appears, was worried about competition and his employees were forced to sign oaths stating that they would make paper only for him and his heirs. The contract or oath with the Italian workers read as follows:[13]

> In the year 1390, Franciscus de Marchia, and Marcus, his brother, and his manservant Bartholomeus pledged their loyalty to me and swore on oath of the holy saints that they would forever be faithful and would not divulge the secrets of paper-making to anyone in all the German lands this side of the mountains of Normandy.

Ullman Stromer successfully operated his Nurnberg mill from 1390 until 1394. His mill gives us our first recorded labor strike in the paper industry. Because of the extra-ordinary precautions taken by Stromer to protect his interests, the Italian artisans concluded that there labors were indispensible. As a result, they tried to hamper the progress of the mill to the extent that Stromer would lease the mill to them. After the first year, Stromer decided that something would have to be done. The Italian workers were locked in a tower and after four days of confinement they were released after they had sworn to cause no more trouble and to work in harmony. After four years, he leased his mill for a period of four years.[14] When the plant was relinquished to him, he operated it with a profit until his death in 1407.

Since the days of Johann Gutenberg, who introduced the printing press

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13 Hunter, op. cit., pp. 232-234.

14 Maddox, op. cit., p. 5.

into the Western world, printers have exercised a tremendous influence over the art and the development of papermaking. At the time that Gutenberg established his printing concern in Mainz, there were no European-made papers satisfactory for this method of mechanical printing. One writer described conditions as follows:[15]

> The paper of Europe was made from macerated linen and cotton cloth, each sheet being dipped in a solution of gelatine rendered from the hoofs, hides, and horns of animals. The linen and cotton rags and the animal glue formed a hard, opaque, and impervious surface well adapted to the European mode of writing with a quill pen, but entirely unsuited for printing.

Consequently, paper that had been made for writing had to be incorporated in the first books which were printed as a temporary expedient. And soon the requirements of the printing trade stimulated refinements in paper fabrication.

From Germany the art of papermaking was transmitted to such countries as England, Switzerland and Holland. The first paper mill was established in England in the year 1494 or 1495 by John Tate, sone of the Lord Mayor of London. He erected and operated a mill at Stevenage, Hertford, until 1498. With the closing of the Tate mill, the art of papermaking in England seems to have fallen into disuse. In 1588, John Spielman re-introduced the process from Germany. He erected a mill at Dartford, Kent, and received a ten year license from Queen Elizabeth. It was a virtual monopoly as other papermakers were required to pay a royalty to Spielman for permission to manufacture. After the time of Spielman, papermaking in England suffered a decline. There were several patents issued and attempts were made to produce paper from various sources but none proved particularly successful.[16]

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15 Hunter, op. cit., p. 62.

16 Maddox, op. cit., pp. 6-7.

From Holland came the man that was to introduce papermaking into the new world. William Rittenhouse, a German papermaker working in Amsterdam, emigrated to America and established the first mill in the colonies near Germantown, Pennsylvania in the year of 1690. Like other mills of this era abroad, the chief raw material consisted of rags. The rags were made into a pulp by the use of stampers or grinders and the moulds were then dipped into this pulp in order to form the sheet of paper.[17]

The growth of the industry, initially, was greatly handicapped by a shortage of rags and skilled labor. During Colonial times appeals were constantly being made to the people to save their rags. In Massachusetts a person was chosen in each town to receive the rags for the mill. In 1744 a British soldier, who happened to be a papermaker by trade, was given a furlough so he could work in a paper mill which had been closed down because of a lack of experienced men. When the Revolutionary War came in 1775, there were only three paper mills in all of New England.

The war effort of the Colonies suffered because of the shortage of labor and material which were necessary to make the paper cartridges so vital to the struggle. So short was the supply of rags that papermakers ran notices, one of which went thus:[18]

"Sweet ladies pray be not offended,
Nor mind the jest of sneering wags;
No harm, believe us, is intended,
When humbly, we request your rags."

Until the end of the eighteenth century, papermaking was mainly a hand process, insofar as the actual forming of the sheets was concerned. At the turn of the century there were two experiments underway that were to greatly

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17 John Cornell, The Pulp and Paper Industry, p. 3.

18 Wheelock, op. cit., pp. 5-7.

influence the whole of the paper industry, from raw materials to finished product. Because of the scarcity of raw materials, investigators had been busy searching for suitable raw materials for the manufacture of paper. In England, one Matthias Koops had been experimenting with the possibility of using wood as a raw material and in 1800 he printed a book on paper which had been made from straw and wood. Part of the pages were from straw paper and part from wood paper.[19] This work by Koops was of prime importance to the future of the paper industry as noted by Hunter:

> "Matthias Koops, living in London, began his experiments in the use of wood, straw, and the de-inking of paper. Three books were compiled by Koops using these materials for the paper upon which they were printed. The greater part of the present-day industry is founded upon the pioneer work of Koops."

A cheap, new raw material for paper had been found.[20]

At the same time in France a method of making paper in an endless web, instead of in sheets, was being developed. It was in the year 1798, that Nicholas Louis Robert first invented his papermaking machine. By the use of this improvement, it was possible to make paper in lengths of 12 to 15 meters. Being in financial difficulties at the time, Robert sold his patent. After the patent had changed hands several times, it came into the possession of the Fourdrinier Brothers whose name it carries today. The Fourdriniers lost their personal fortune trying to perfect the machine and died almost without means. However, the dawn of the machine-age in papermaking had arrived.[21] This was true because the use of the Fourdrinier machine cut the production time of paper from two to three months to a matter of days.

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19 Weston, op. cit., pp. 12-13.

20 Hunter, op. cit., p. 523.

21 Maddox, op. cit., pp. 8-9.

Contemporary with the invention of the Fourdrinier machine was the work being carried on in England by John Dickinson. To Dickinson, of Hertfordshire, goes the credit for the invention of the cylinder machine. The machine was first used in Dickinson's mill in 1809. The machine was basically the same as the Fourdrinier, but differing in the method employed to form the web of paper. In the Fourdrinier the pulp was fed onto the woven wire, while in the cylinder machine, the woven wire, in the form of a cylinder, was revolved in a pulp vat. The pulp was made to adhere to the cylinder by means of a vacuum.[22]

Thomas Gilpin was the first man to successfully make paper by machinery in the United States. The machine used was one of the cylinder type and began operation in August of the year 1817 near Wilmington, Delaware. The material used by Gilpin was rags.[23] The cylinder machine, however, was not to have the effect on the newsprint industry that the Fourdrinier was to have. The cylinder type was to develop into a kraft paper machine while the Fourdrinier type was to be used almost exclusively for the manufacture of newsprint.

The first Fourdrinier to be used in the United States was an importation from Europe. Henry Barclay of Saugerties, New York, imported a machine from England which was put into operation in October of 1827. English paper manufacturers objected to the shipping of the machine because they feared the competition which might develop in the United States. In 1828 another one was put in operation in the United States. It had been built in France for use in the Pickering mill of North Windham, Connecticut. By the year 1851, there were nearly 200 Fourdriniers in operation throughout the world, but of

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22 Hunter, op. cit., p. 350.

23 Ibid., p. 351.

these only two of them were located in America. Still, the great bulk of paper in the United States was hand-made at this time.[24]

Prior to the introduction of the cylinder and Fourdrinier paper machines early in the nineteenth century, the making of paper had been a laborious process of making one sheet at a time. This made for a high cost and relatively little use of paper. However, with mechanization, it was possible to make a continuous sheet of paper. Output was greatly increased and cost of production lowered.

By this time the number of daily newspapers had increased to the point that they were the principal users of paper. During this early period of paper manufacturing, the mills and the newspapers were in the closest of harmony. It was not uncommon for a small mill to be established in order to supply the needs of local printers.

In the early stages of newsprint manufacture, the papermakers were handicapped by a shortage of raw materials. Many were tried as a source of cellulose. In 1828 a patent was taken out for making paper from straw and hay. Two years later basswood and hemlock were tried. A method of making paper from husks of Indian corn was patented in 1838. These are but a few of the many materials utilized.

Straw was the first of these many materials to prove successful on a commercial scale. By 1860 several large newspapers, such as the Philadelphia Public Ledger were utilizing paper manufactured from it.[25] Straw continued to be of importance in paper manufacture until about 1880 at which time it

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24 Hunter, op. cit., pp. 355-373.

25 John A. Guthrie, The Economics of Pulp and Paper, p. 2.

constituted forty per cent of all the raw material. Of the total of 619,682 tons of all raw materials going into paper in 1880, 40 per cent was straw, 29 per cent was rags, 14 per cent old paper, and 14 per cent Manila stock.[26]

The use of wood, for a raw material, on a commercial scale did not begin until after 1850, although, as mentioned before, a process for making paper from basswood had been patented in 1830. The soda process for the manufacture of paper from wood was the first one used on this continent. By the time of the Civil War sulphite pulp and groundwood pulp were also being used commercially. And thus was ushered in a new era in the manufacture of paper. The newsprint manufacturers in America now had an adequate supply of a good raw material--wood.

Hence, recognition of the need for an improved medium for recording history and for the transfer of knowledge started man on his long quest for a satisfactory material. Most of his early attempts to satisfy this need were unsuccessful and it was not until the invention of paper in China that he discovered a material which seemed to fit his requirements. However, there was a drawback even to paper. Materials which were used in the fabrication of paper were chiefly cotton and linen rags and the demand always seemed to exceed the supply. So, man searched for a source material which was both cheap and plentiful. Also man was handicapped by the slow method of hand production. Between the years of 1795 and 1870, his efforts seemed to be crowned with success, for it was in this period that he discovered a method of manufacturing paper mechanically and also found a source of a raw material which was both cheap and plentiful. This was the beginning of the age of wood as a material in papermaking.

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26 Guthrie, op. cit., p. 3.

CHAPTER II

THE AGE OF WOOD IN PAPERMAKING

The use of wood as a material from which to make paper was first suggested in the Occident by Rene Antoine Ferchault de Reaumur, a Frenchman.[1] It was early in the eighteenth century that Reaumur first put forth his idea for the use of wood. Reaumur got his inspiration by watching a paper wasp in its nest-building activities. The inventor was particularly interested in the way the insect wore down the wood of a dried post or board and then, after mixing it with a body secretion, turned it into a paper-like substance. As early as this, Reaumur made an attempt to imitate the wasp in its paper-making process, but it was not until the 1860's that wood was used on a commercial scale in the making of paper.[2]

It has been said that the early 1860's were the beginning of the paper era. It was at this time, during the Civil War and immediately after, that research in the development of wood-fiber for the use of paper became so prominent. This improvement went hand in hand with experiments in the manufacture, not only of newsprint, but in all manner of articles made of paper. Therefore, it may be stressed that the perfection of wood-pulp for paper had some immediate effects on the paper industry.

In the early 1860's newsprint paper was selling for about twenty-five cents a pound. When the groundwood pulp first came on the market it was

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1 Dard Hunter, Papermaking: The History and Technique of an Ancient Craft, p. 313.

2 John Cornell, The Pulp and Paper Industry, p. 3.

sold at eight cents a pound, but shortly thereafter the price dropped to four and five cents a pound where it remained static for a time. It later fell to the unheard of price of one cent a pound. The net results of this new cheap product was the reduction of the price of newsprint from fourteen cents in 1869 to two cents and less in 1897. In the matter of cost alone, the effect of the new groundwood paper was revolutionary.[3] In spite of this lowered cost the newspapers did not shift en masse to the use of the new wood product.

Apparently the first use of wood-pulp paper for newspaper printing in this country, about which we may be certain, occurred on January 14, 1863. It was at this time that the Boston Weekly Journal put out an issue on all-wood-pulp paper. The Daily Journal published by the same establishment of the same date was printed on the regulation all-rag paper. There was considerable difference in the quality of the paper used in these two issues, the rag paper being much finer than that manufactured from wood.

This was not, however, the first newspaper to shift to the use of wood-pulp paper for everyone of its editions. The New Yorker Staats-Zeitung was the first paper in America to use only wood paper. The Staats-Zeitung switched to wood-pulp paper for all of its editions in 1870. It is, perhaps, appropriate that the Staats-Zeitung was one of the earliest American newspapers to make regular use of it, inasmuch as the groundwood process was perfected in Germany.[4] This conversion to all-wood paper by some of the newspapers was the beginning of a vast expansion in the newspaper field.

The phenomenal growth of the paper industry was made possible by the use of wood as a raw material. It also furnished a source that conserved the

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3 Hunter, op. cit. pp. 380-399.

4 Ibid., pp. 389-399.

supply of rags for use in the making of fine papers. Wood, as originally intended, was to serve as a substitute for rags, but it became an important material for increasing the scope and variety of papers to meet an ever growing demand for new uses of paper which were constantly being introduced at this time.

With the discovery that wood pulp could be used in place of rags in the fabrication of paper, consumption of newsprint in great volume became possible. Although newspapers of limited circulation and size had been published before that time, both here and abroad, it was not until after 1867, when the wood-using process was introduced into the United States, that production and consumption of paper began their rapid increase. The increase in paper manufacturing was not pronounced during the first decade after the introduction of the process, but in the following two decades production expansion was at an amazing rate. From 1879 to 1899 the volume of paper manufactured in the United States increased from 452,000 tons to 2,168,000 tons.[5] Production increased at a somewhat less rapid rate thereafter, but consumption continued steadily upward until it soon outstripped domestic production. About this time newsprint paper became a specialized product.

Shortly before the turn of the century the Fourdrinier machine making newsprint was differentiated from others making writing, book, wrapping, and tissue papers. This tendency toward specialization in design came about because newsprint or "print paper" as it was then known, had become almost a standard product made largely of ground wood and some sulphite. Such "print paper" was made in a fairly narrow range of "basis weights," and with generally similar characteristics.[6]

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5 John A. Guthrie, The Newsprint Paper Industry, pp. 4-16.

6 W. G. MacNaughton, Newsprint Paper Machine Operation, p. 3.

With standardization of paper machine design and of the resultant product, "higher machine speed" became the ambition of the mills making newsprint. The average speed of eighteen newsprint machines in the United States was 351 feet per minute in 1900. In 1905 the average speed of these machines had increased to 376 feet per minute. The average speed obtained in 1907 was 393 feet per minute. As machine speeds passed 500 feet per minute and were advanced to 1,000 feet per minute, and again to 1,300 feet per minute, the design and mechanical construction of the various paper machine units have changed radically. At the present time the industry is looking forward to machine speeds around 1,700 feet per minute. Contemporary with this increase in speed of the machines was the increase in width, increasing from 57½ inches in 1891 to 228 inches at the present time.[7] The increase in speed of machine, production, and consumption were not the only changes taking place in the newsprint industry. A shift in location was also being made at this time.

By 1900 newsprint manufacture had spread from New England to northern New York, and then to northern Wisconsin and northern Minnesota. From there it spread to the Pacific coast where spruce and hemlock pulpwood, as well as water power for grinding were available. The location of the factories shifted from the New England area to the timbered states around the Great Lakes. Such states as New York, Pennsylvania and Wisconsin became more important. By 1939 Washington was the leading state in the production of pulp. In 1946 the three leading states were Washington, Maine, and Louisiana in that order, although it does not hold that these three states were the leaders in the manufacture of newsprint.

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7 MacNaughton, op. cit., pp. 3-55.

As the center of the lumber production shifted, so did the center of pulp production. The pulp mills had a tendency to follow in the wake of lumber production. After a State had passed its peak in lumber production, they came to the fore in the production of pulp.[8]

In the actual production of newsprint the leading states are Washington, Oregon, and Maine. Texas has become a producer of newsprint within the last eleven years and a mill went into production in Alabama in 1950. Before these two southern states went into newsprint production the United States was divided into three districts, but now the Southern states constitute a fourth. These four districts in order of importance are (1) Maine and New England, (2) Pacific Coast, (3) Lake States, (4) Southern States.[9]

As mentioned previously, the consumption of newsprint increased rapidly from about 1879 to 1899 and then the rate of increase was not as great, but it was still rising. There were several causes for this increase in demand. In the late nineteenth and early twentieth centuries immigrants from Europe and elsewhere were pouring into the United States. This created a demand for foreign-language newspapers. Free schools reduced illiteracy and stimulated the interest of people in public affairs. The Great War added tremendously to the interest in current events and as the newspapers provided almost the only means of disseminating news, their circulations increased steadily. With the foregoing taken into consideration, it is not surprising that, especially in the larger cities, the daily-paper habit has now become firmly established on this continent. It is estimated the readers today spend fifty-four minutes scanning the daily papers. This habit is likely to continue as long as papers can be obtained cheaply.[10]

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8 Guthrie, op. cit., p. 3.

9 Ibid., pp. 4-16.

10 Ibid., pp. 168-171.

The value of the press as an advertising medium is an equally important factor in the growth of newspaper consumption. As the population of the United States became larger and more prosperous the demand for advertising space in newspapers increased proportionately. The advertising lineage in fifty-two major cities increased from 1,897 million agate lines in 1929 to a total of 2,440 million agate lines in 1950, while in 1914 it was only 662 million agate lines.[11]

According to Guthrie, the increase in the consumption of newsprint is as follows:[12]

Table I

Newsprint Available For Consumption In The United States
(Thousands of tons)

Year	Available for Consumption	Per Capita Consumption (lbs.)
1890	196	8
1899	478	15
1904	743	19
1909	1,153	25
1913	1,482	--
1917	1,824	--
1921	2,000	37
1922	2,451	45
1924	2,821	48
1925	2,955	51
1926	3,517	57
1927	3,461	58
1928	3,563	59
1929	3,796	62
1930	3,551	58
1931	3,212	52
1932	2,793	45
1933	2,728	43
1934	3,148	48
1935	3,272	52
1936	3,658	57
1937	4,246	59
1938	3,088	53
1939	3,541	54

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11 American Newspaper Publisher's Association, Newsprint Statistics 1950, Newsprint Bulletin No. 17-1951, Volume VIII, p. 72.

Guthrie, op. cit., pp. 4-16.

12 Ibid., p. 234.

Along with the growth in population and advertising, technical improvements in printing have also contributed to the increase in newsprint consumption. The addition of special features in the newspapers, especially the Sunday editions, has come about through the discovery and introduction of such machines and techniques as rotary power presses, photo-engraving, etc. Photo-engraving, by stimulating the use of multi-color printing, has been an important factor in the development of magazine and comic sections in Sunday editions. Competition among publishers to make Sunday editions as attractive as possible has resulted in those issues being increased in size. Other sections such as financial, sport, and comic have been expanded into separate sections for the same reasons. In addition to this, special and magazine sections have been added.[13] From the above it is clear that the great increases in population, in advertising, in technological improvement and in printing in this country have resulted in a tremendous increase in the consumption of newsprint. It is true that there has been some fluctuation, but the trend remains the same.

Although there has been some fluctuation, the trend in both total and per capita consumption of newsprint has been almost steadily upward. Since this commodity was first classified separately in the United States Census of Manufactures, both the total and per capita consumption of this article has increased enormously. From 1890 until 1909, the United States had a slight export surplus, but after that year the increased demand for paper rapidly outstripped domestic production.[14]

The consumption of newsprint on this continent has been, and for that matter still is, concentrated very largely in the eastern half of the United

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13 Ibid., p. 9.

14 Ibid., p. 11.

States, particularly in the region east of the Mississippi and north of the Ohio and Potomac rivers. It is in this area alone that approximately seventy per cent of the American total is used. Very little is consumed in the West except in the large cities on the Pacific coast.[15]

Compared with figures of previous years, the 1950 circulation of weekday newspapers in the United States and Canada averaged over 57,000,000 copies a day for the six months period ending September 30, 1950, and means:[16]

--a gain of more than 1,000,000 copies a day (or 1.9%) over 1949
--a gain of more than 1,500,000 copies a day (or 3.1%) over 1948
--a gain of almost 6,000,000 copies a day (or 11.7%) over 1945
--a gain of almost 27,500,000 copies a day (or 93.3%) over 1920.

The total consumption of newsprint has also shown an increase in the last decade. Although, as stated before, the rate of increase is not so great, the trend is still upward.[17] The table below shows this expansion.

Table II

Consumption of Newsprint in the United States

Year	Consumption (tons)
1940	3,709,028
1941	3,826,831
1942	3,779,920
1943	3,661,180
1944	3,242,891
1945	3,507,309
1946	4,296,268
1947	4,752,904
1948	4,909,829
1949	5,529,206
1950	5,936,941

The evolution of papermaking processes coupled with the improvements in the printing presses and printing techniques brought radical changes to the

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15 Guthrie, op. cit., p. 14.

16 American Newspaper Publisher's Association, Bulletin No. 33, (February 2, 1951), p. 33.

17 Summary of Sales and Statistics, 1940-1950, Southland Paper Mills, 1951.

newsprint industry. Only a few hundred sheets of paper a day were turned out by the hand method of manufacture, while today the production of a single papermaking machine is in excess of 200 tons. The printing of newspapers grew from 300 pages in an hour to 4,000,000 pages in the same period on a single press. Today, with the aid of modern machinery, one man can make 10,000 times as much paper in a day as did the inventor of papermaking in China 1,800 years ago. In 1810 only 500 tons of newsprint were made in America as contrasted to a total of 6,282,182 tons which were made in 1950. In 140 years the output has grown 12,600 times. In the United States, the world's largest newsprint market, the per capita consumption has risen from 1/7 of a pound in 1810 to 78.4 pounds in 1950. To get a clearer picture of just how much volume this really is, one author has drawn up the following analogies:[18]

> Picture a train of 130,000 freight cars 1,000 miles long, each car carrying 25 tons of newsprint paper. Or 650 steamships each with 5,000 tons of paper stowed beneath its hatches. Or 290,000 motor trucks each loaded with 15 rolls of paper and every roll weighing 1,500 pounds each.
>
> These are the annual equivalents of newsprint consumption in the last ten years in the United States. Could this yearly supply be put into one gigantic roll (72" wide) it would unroll for a distance of 18,000,000 miles. It would make a sheet 450 feet wide and reach from the earth to the moon. No wonder that this is often spoken of as the "paper age".

The United States has not been self-sufficient in newsprint since the year 1909. In fact, of the tremendous amont of newsprint used annually, by far the largest per cent of it is imported from Canada which tends to supply more of the total each year. The United States also imports a small per cent of its newsprint from Europe, the remainder of its total being of domestic production.[19] The following data illustrates production and trends.

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18 The Story of Newsprint Paper, The Newsprint Service Bureau, pp. 26-33.

19 American Newspaper Publisher's Association, Newsprint Bulletin No. 17, (February 28, 1951), p. 56.

Table III

United States Newsprint Supply and Sources[20]

Year	Thousands of tons from: Canada	Europe	U. S.	Per cent of total from: Canada	Europe	U. S.
1929	2,326	96	1,374	61	3	36
1940	2,741	34	998	73	1	26
1941	2,987	3	995	75	0	25
1942	3,007	2	933	76	0	24
1943	2,681	0	789	77	0	23
1944	2,530	0	709	78	0	22
1945	2,666	0	707	79	0	21
1946	3,563	13	754	82	0	18
1947	3,897	129	824	80	3	17
1948	4,128	267	858	79	5	16
1949	4,380	255	884	79	5	16
1950	4,742	172	991	80	3	17

It is a well recognized fact that pulp and paper can be produced from almost any fibrous raw material. Of all the many materials tried, no source of cellulose has yet been discovered which can equal wood. Wood is superior in suitability for the many types of paper and in cheapness per unit weight of pulp.

The woody tissues of plants are made up of cells which show a great diversity in size, form, and markings. The papermaker is particularly interested in the true wood fibers, or libriform cells, and the tracheids. In shape the wood fibers are always spindle or fiberform, with relatively thickened walls. The length of these fibers varies with different woods, ranging from 2.0 mm. to 0.14 mm., but in all cases they are the longest elements present.[21]

The tracheids are elongated and tapering cells, which are more or less lignified. The wood in coniferous trees, such as spruce, fir, and hemlock,

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20 American Newspaper Publisher's Association, op. cit., Bulletin No. 17, p. 57.

21 Edwin Sutermeister, The Chemistry of Pulp and Paper, p. 45.

consists almost entirely of tracheids. These tracheids are generally much longer than the libriform fibers from other woods and therefore contain greater papermaking value.

There is a difference, too, in the fibers located in the various parts of the same tree, the outer layers of the trunk being of higher quality. The sapwood, or that of comparatively recent growth, contains more fermentable material than the older and denser heartwood and is usually lighter in color. Each year a layer of sapwood changes into heartwood and becomes harder and darker from infiltration of coloring matters, resins, etc. Sapwood is usually preferred for paper pulp because in both the mechanical and chemical processes it is more easily reduced than is the heartwood. However, there is no difference in color and hardness between sapwood and heartwood in such woods as the fir and buckeye. The yields and qualities of fiber will vary in wood taken from the same tree and from different parts, such as the trunk and the branches.[22]

In coniferous trees, the length of tracheids will vary considerably. This variance is not only in different parts of the same tree, but also within the same annual ring at the same distance above the ground. The average length increases from the center outward, in both trunk and branches, until the tree reaches its maximum height. After the maximum height is reached the length remains quite constant. The character of the soil and the amount of moisture available will also cause the tracheids to vary in length. Trees growing in rich, moist soil have longer tracheids than trees which are growing in dry soil.[23]

In a study of growth conditions of Southern yellow pines as related to

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22 Sutermeister, op. cit., pp. 44-47.

23 Ibid., p. 48.

the quality of fiber produced, the most important factor was found to be the relation of springwood to summerwood. Springwood fibers are thin walled and collapse into flat ribbons, thus tending to produce dense, closely knit, well-formed paper with a smooth surface. In contrast, the summerwood fibers are thick walled and needlelike. These summerwood fibers do not collapse and so give a bulky paper of uneven formation and rough surface. As the proportion of springwood increases, the papers give higher bursting and tensile strengths, but lower tearing resistance. As a result, the springwoods are better for making printing and wrapping papers where density, good formation, smoothness of surface, and high bursting and tensile strengths are essential.[24]

The woods most generally used for sulphite in the United States are spruce, balsam, and hemlock. Poplar and hardwoods are used for soda; spruce for groundwood; and southern pine for sulphate. Other woods are used for all of these processes in quantities depending upon such factors as ease of reduction, fiber length, color, cost, and the location of the mill with reference to its tree supply. Four varieties make up the bulk of the pine woods available in the southern states: Longleaf pine, (Pinus palustris), shortleaf pine (Pinus echinata), loblolly pine (Pinus taeda), and slash pine (Pinus caribaea). The wood of these pines varies greatly in density, rate of growth, and relative proportions of spring- and summerwood. A typical average sample of pulp from these pines contains about sixty per cent springwood and forty per cent summerwood fibers.[25]

The chief use of the southern pines has been in the sulphate process for the production of unbleached stock for wrapping and kraft papers. However, excellent mechanical pulp may be made from the sapwood of the southern

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24 Sutermeister, op. cit., p. 50.

25 Ibid., pp. 51-56.

pine and modern methods of bleaching are now making the fibers available for white or light-colored papers, which would include newsprint.[26]

Of the various methods of producing pulp, perhaps the one of greatest importance to the newsprint industry is the mechanical or groundwood process. In this method, the logs are first cleaned of bark and dirt. Then they are forced against the face of a revolving grindstone by means of hydraulic pressure. Water is used as a cooling agent on the stone and also to carry away the ground fibers. All of the constituents of the original wood are contained in the pulp which is produced by the mechanical method. The yield of pulp per cord of wood is high, being about ninety per cent of the original amount. Only a wood which is light in color is normally used for this process because the pulp is not usually bleached. Groundwood pulp adds body and opacity to paper, but because of its short fiber, does not add to the strength of the paper. Besides being used in newsprint, which is its primary use, it also goes into the manufacture of catalogues, wrapping, tissue, and wall-papers.[27]

Also used in making newsprint pulp are two chemical processes, the sulphite and the sulphate methods. The two processes are basically the same except that a different cooking liquor is used in each method. The cooking liquor in the case of the sulphite method is calcium bisulphite while in the sulphate method it is a mixture of sodium hydroxide and sodium sulphide. The basic concept of these methods is that of separating the cellulose fibers of the wood from the non-cellulose parts by the use of chemicals. The logs are first barked and then chipped. From there they go into the digestors, where

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26 Sutermeister, op. cit., p. 58.

27 John A. Guthrie, The Economics of Pulp and Paper, pp. 26-27.

they are cooked for several hours under steam pressure in the presence of cooking liquor. The lignin or non-cellulose components of the logs are dissolved out, leaving the cellulose or pulp.[28]

The sulphite method is well suited to the pulping of non-resinous, long-fibered softwoods such as hemlock, spruce, balsam, and white fir. The yield of long fiber pulp is about forty-five per cent of the original weight of wood and is light in color and easily bleached.

The sulphate method is used more in the pulp preparation of resinous woods, the principal species being southern pines, jack pine, Douglas fir, hemlock, and spruce. By this technique the yield is also around forty-five per cent of the weight of wood.[29]

Perhaps it would be well to define just what is meant by the term "newsprint." The term "standard newsprint paper" as used in paragraph 1772 of the United States Tariff Act of 1930 has been interpreted by the United States Customs Court to be that form, class, or standard of newsprint paper which was chiefly used for printing newspapers on or prior to June 17, 1930. The Treasury Department has defined this to mean paper which conforms to the following specifications:[30]

> Weight--500 sheets, each 24 by 36 inches, shall weigh not less than 30 pounds or more than 35 pounds.
> Rolls---The paper shall be in rolls not less than 16 inches wide and 28 inches in diameter.
> Sheets--Not less than 20 by 30 inches.
> Stock---Not less than 70 per cent of the total fiber shall be groundwood, the balance shall be unbleached sulphite.[31]

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28 Guthrie, op. cit., p. 28.

29 Ibid., p. 29.

30 American Paper and Pulp Association, The Dictionary of Paper, pp. 236-237.

31 This was before the sulphate method was used in the South in the manufacture of newsprint.

Finish--The average of five tests in machine direction and five tests in cross direction on both sides, moving the paper after each test, made with the Ingersoll glarimeter, shall be not more than 50 per cent gloss.
Ash--Shall be not more than 2 per cent.
Degree of Sizing--The time of transudation of water shall not be more than 10 seconds by the ground-glass method or five seconds by the alternate methods.
Color--Such colors as are chiefly used in the publications of newspapers.
Thickness--Not exceeding 0.004 of an inch.

As mentioned previously, standard newsprint is available in colors, such as pastel shades of pink, peach, green and salmon, that are customarily used in newspapers. This includes the publication of special editions or supplements of newspapers. All canary-colored paper has been excluded from the newsprint classification by court decision. Blue newsprint is also a dutiable paper, if imported, and therefore is not classified as standard newsprint.[32]

In addition to meeting specifications regarding content, newsprint must also meet certain requirements, or specifications, in so far as quality is concerned.[33] In newsprint, the essential elements of quality are the following:

1. Even formation as shown by the clearness of "look through."
2. Uniformity of basis weight and thickness.
3. Smoothness of surface.
4. Adequate tensile strength, particularly in the machine direction.
5. Cleanliness and freedom from shives.
6. Uniformity of color.
7. Adequate opacity.
8. Satisfactory printing ink absorbency.
9. Freedom from mechanical defects, such as slime spots, calender cuts, etc.

The mills or companies which produce newsprint, like factories in other industries, are divided into groups or classified according to whether or not they are integrated. The classification of the paper mills is reported by

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32 Eighth Annual Edition, The Paper Year Book, p. 444.

33 MacNaughton, op. cit., p. 9.

Cornell as follows:[34]

A. Integrated Companies----
A part of the mills manufacturing paper are completely integrated, manufacturing both pulp and paper. These companies own their own timber lands from which they draw their supplies of pulpwood. The logging operations of integrated companies are in themselves undertakings of great magnitude necessitating the employment of large numbers of men in the woods and for transportation to the mills.

B. Non-Integrated Companies----
Other paper companies are non-integrated, manufacturing only paper, and not pulp. These non-integrated companies buy their supplies of pulp from domestic pulp mills, or purchase imported pulp made chiefly in Scandinavia.

With the advent of wood as the primary papermaking material, papermakers and publishers considered wood as an inexhaustible source of a raw material. This however, has not proved to be true. Although there is enough wood to last for countless years, the industry is already in the midst of a campaign to conserve the timber resources. The Chicago Tribune, which owns its own newsprint mill, has laid down rigid conservation rules regarding the manner in which trees shall be felled. Lumberjacks are forbidden to cut any tree more than eighteen inches above the ground, even though its base be buried in five or six feet of snow. Practically all of the tree trunk can be utilized by this low method of cutting. To prevent further waste, the lumberjack may cut only a small notch into the tree with his axe. Formerly it was customary to cut a deep, wide notch.[35]

In the South, there is a program being carried out which emphasizes the cutting of selected trees instead of completely clearing the timberlands. The South is also engaged in a large replanting program which is being backed up by the individual states. Tree farming is becoming a prominent conservation

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34 Cornell, op. cit., pp. 3-4.

35 The Chicago Tribune, Trees to Tribunes, p. 23.

practice in the Southern states. This conservation program in the South was started by the kraft paper industry which has been in the South for several years, but it has been encouraged by the newsprint industry, which had its inception in the year 1940.

And so, the introduction of wood as a basic source of paper material brought about many changes in the paper industry. Because the use of wood made paper cheaper and more plentiful, the production and consumption of this commodity rose at a rapid rate. Newspapers started using woodpulp paper and the sale of newspapers increased at a fairly rapid rate.

It was about the turn of the eighteenth century that newsprint came to be differentiated from other products. Standards were set up for the manufacture of newsprint and the newsprint machines underwent a considerable change in regards to speed of production and width of machine.

After the newspapers had expanded in number and size, the demand for newsprint was so great that domestic production was no longer sufficient to satisfy these demands. In order to satisfy the requirements of the newspapers, newsprint was imported from Canada, and they became the chief source of newsprint consumed in the United States. Production of newsprint in the United States has been concentrated successively in the Lake States, New England and the Pacific Coast States. However, with the utilization of Southern yellow pine and a new and very important district has come into the picture--the Southern States. The South promises to be one of the most important sources for pulpwood for the production of newsprint and compete with the older producing areas of North America.

CHAPTER III

BACKGROUND AND FORMATION OF SOUTHLAND PAPER MILLS

The pulping of Southern pine had long been considered impractical because of the high resinous composition of the wood. It was thought that this resinous content would lead to difficulties from pitch during the pulping process. This notion resulted from failure to observe that the older growth of trees contained a high resinous content while the young trees were without it; that the heartwood, which is highly developed in the older trees, is the cause of the resin content, while sapwood, which is characteristic of the younger trees, is free from resin. In fact, an almost pure white paper may be produced from the sapwood of the yellow pine. Trees which have had as short a growth as six or seven years are usable, and at that age often reach a size of six inches in diameter.

As long ago as 1931, Dr. Charles Holmes Herty made a public statement that within five years from that time the making of newsprint from southern pine would be entirely feasible, and that a new industry of enormous proportions would arise in the South as a result.[1] On January 1, 1932, a laboratory was set up in Savannah, Georgia, by joint appropriation of the Georgia State Legislature and the Chemical Foundation, Inc., of New York. Dr. Herty, who had long dreamed of discovering a process by which the bountiful crop of second growth pine in the South might be turned into newsprint and other

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1 Dard Hunter, Papermaking: The History and Technique of an Ancient Craft, p. 399.

sulphate paper uses, was placed at its head.[2] The purpose of this laboratory was to carry on experiments in the utilization of Southern pine. Dr. Herty's prediction came true, but not on a commercial scale. In 1933 nine Georgia newspapers printed their regular editions on newsprint made from Southern pine which had been processed in Thorold, Canada. It was not until the year 1940 that Southern pine was to be utilized on a commercial scale for the production of newsprint. However, the experiments which were being carried on aroused the Canadian newsprint producers.

In January of 1934, at a meeting of the Canadian Pulp and Paper Association, Mr. A. A. MacDiarmid, Chief Engineer of Price Brothers and Company, Limited, had this to say regarding the work being done in Savannah:[3]

> "The research work that has been carried on by the State of Georgia over the past two years, in the Savannah laboratory, on the pines of the southern United States, appears to indicate that the undisputed position which northern woods had held in the newsprint field may soon be challenged.****It is well to remember that fifteen or twenty years ago the North, including Canada, was making practically all the kraft paper for this continent, and the South experimenting with their pinewoods for this same market. But in the last nine years the production of kraft pulp and paper in the United States has more than doubled, and this increase has been principally in the South. Over the same period the exports of kraft pulp from Canada to the United States have decreased by more than sixty per cent.****If our important industry is to withstand the serious threat of Southern competition, action had best be taken before Southern mills are built; afterwards, it will be too late."

Shortly after this, in the year 1936, a Texas lumberman and industrialist, Ernest Lynn Kurth by name, met Louis Calder, the president of the Perkins-Goodwin Company. This meeting was to drastically alter the balance of the newsprint industry of the United States, for it was here the seed

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2 Robert M. Baur, "Under the Pulpwood Tree." Christian Science Monitor Magazine, (October 13, 1937), p. 6.

3 The Development of Southland Paper Mills, Inc., p. i.

which was to sprout and grow into the Southland Paper Mills, Inc.,[4] and a new industry for the entire South, was planted. It was the foresight and leadership of these two men coupled with the faith and hard work of countless others that made the development of a newsprint industry in the South an actuality instead of a possibility.

At that time Calder expressed the firm belief that newsprint would have to advance some in price during the next decade and that the building of a newsprint mill in the South or Southwest would make a successful business venture, provided, of course, that the resinous content of Southern pine trees could be controlled. Calder discussed the possibilities of newsprint manufacture in the South and Southwest with Mr. Francis P. Garvin, of the Chemical Foundation and Kurth had talked to Dr. Herty of the Savannah Laboratory. Later, Calder discussed the situation with Herty and became convinced that it was feasible to manufacture newsprint from Southern pine.[5]

With the idea firmly intrenched in their minds that the Southern pines could successfully be utilized for newsprint, Kurth and Calder set the machinery in motion which was to culminate in Southland. It was a long, bitter struggle with many disappointments, but with their goal in mind they stuck steadfastly to their task. It was necessary to consult the industrialists of the South as well as the financial men in order to get financial backing and technical advice.

Help was also forthcoming from the publishers of the South. They were tired of having the Canadian market control their newsprint. The publishers, in order to be freed from their dependence upon Canadian paper, gave financial

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4 Hereafter referred to as Southland.

5 Ernest Kurth, Speech before the Texas Newspaper Publisher's Association, Galveston, Texas, (June 16, 1949).

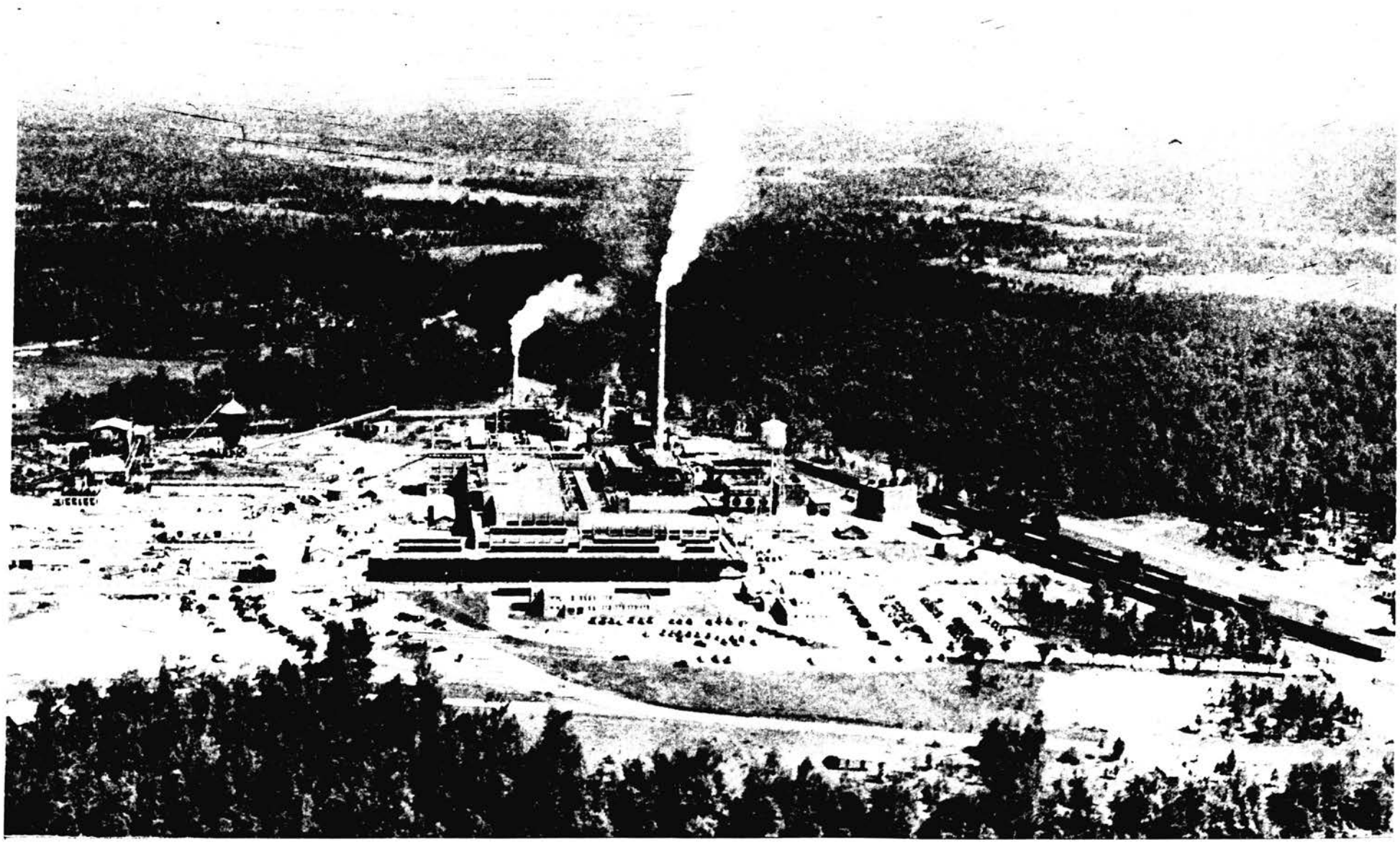

FIGURE 1. AIR VIEW OF SOUTHLAND PAPER MILLS

help as well as consulting and helping in any way they could. At this time the United States was manufacturing only about one third of the paper which was consumed in the United States. Seventy-seven per cent of the Canadian export went to the United States and represented sixty-one per cent of the total United States supply. Not only did they dislike the idea of being dependent upon Canadian sources of newsprint, but in conjunction with that was a steady increase in price. The publishers had the feeling that the Canadian producers were trying to see how much the traffic would bear. The Canadian price increases stimulated the drive for a Southern newsprint industry and the publishers came out in favor of establishing a Southern industry which would give them paper at a considerably lower cost per ton.[6]

Led by E. K. Gaylord of the Oklahoma City Times, Ted Dealey of the Dallas News and James G. Stahlman of the Nashville Banner, the publishers told Kurth they would take all the newsprint he could produce in the first five years.

The pulp and paper plant were to cost some $7,000,000.00 at the outset. This was a vast sum to raise, even for a man of Ernest Kurth's substantial fortune. The Reconstruction Finance Corporation agreed to lend him a part, $3,500,000.00, if he could match the sum with Texas collateral. Louis Calder supplied half a million dollars.[7]

Actual production came within six years of the time Calder met Dr. Herty, in whose honor the newsprint millsite was named. The eminent research chemist and foremost authority on chemical properties of pine trees had insisted that newsprint could be made from Southern pine on a commercial basis. Louis Calder became convinced that the idea was a sound one. He began making surveys

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6 "Boost Southern Newsprint." Business Week, (June 12, 1937), pp. 30-32.

7 Frank X. Tolbert, "Paper Prophet." Colliers, (April 28, 1951), pp. 32-33.

throughout the South in preparation for the building of a newsprint mill. It was two years later that he met Kurth; four years later, a multi-million dollar Southland mill actually was manufacturing newsprint and a new industry, which was to alter considerably the importance of the Southern pine trees, was born in Texas.

In February of 1938 the Pulp and Paper Laboratory of the Industrial Committee of Savannah, Inc., became the Herty Foundation Laboratory, under an act of the Georgia legislature. Dr. Herty spent the last eight years of his life trying to make commercial newsprint from Southern pines. In his Savannah laboratory he found a process that worked, but died in 1938, before the South's lumber men could build him a mill.[8] The work he had started was carried to completion and in April 1939 the mill at Lufkin was dedicated.

At the mill's dedication on April 27, 1939, Lou Calder said:[9]

> "I am willing to go on record as predicting a very large expansion of this mill within a few years. After we have proved that good newsprint can be commercially made of Southern pine many other newsprint mills will undoubtedly be fuilt in the South."

On January 17, 1940 the newly completed Southland Paper Mills at Lufkin, Texas, with a potential output of 150 tons daily, produced the first newsprint made from southern pine for continuous commercial consumption. This paper met every test of the fast-running newspaper presses and received high praise from the pressmen for its excellent running and printing qualities. Thus began a new phase of industrial development in the South.

The Lufkin Daily News of Tuesday, January 23, 1940, was the first newspaper to use a commercially made Southern-pine paper. Shortly thereafter the Dallas Morning News followed suit and printed a thirty-five ton edition

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8 "The Herty Foundation Laboratory." Science, Volume 88, (September 23, 1938), p. 274.

9 Louis Calder, Speech at the Dedication Ceremony, Lufkin, Texas, (April 27, 1939).

entirely on Southland paper.[10]

Southland, from the beginning up to 1950, has expanded from a modest, one-machine mill with a capacity of a hundred and fifty tons daily, without a chemical pulp plant, to a newsprint mill of 375 daily tons, with a chemical pulp and board production of approximately 200 tons daily.

Southland has done more than merely supply the newsprint need of publishers in the four-state trade area. It has provided a market for the East Texas tree crop; an income to landowners who annually supply the hundred of thousands of cords of pulpwood to the Lufkin mills. Nearly a thousand families in Lufkin alone look to Southland for their livelihood, turning a huge annual payroll into Texas channels of trade.[11] The pulp and paper industry is unique in that its principal natural resource, pulpwood, is one natural resource that can be replaced, thus assuring a practically unlimited supply.

It is not difficult to see the effect that this consumption will have on the timber owners of the Southern pine country. The South has the added advantage of being able to grow this natural resource in a much shorter time than it can be done in the North. Under present reforestation methods, this can be done at relatively small cost and in about a quarter of the time necessary in the North.

Another and very important aspect of the manufacture of newsprint in the South is the way in which it complements or fits in with already established commercial ventures. For illustration, the entire area of the East Texas pine belt is a forest and lumber products area. Forest products are important to many industries and the people of this region are dependent upon the forest

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10 "Southland Paper." Time, Volume 35, (February 12, 1940), p. 48.

11 Millard Cope, Publisher, Marshall News Messenger, Speech before the Texas Newspaper Publisher's Association, Galveston, Texas, (June 16, 1949).

either as lumbermen, laborers, timberland owners or woodcutters. The newsprint industry does not compete with the above mentioned industries, but rather supplements them.

The newsprint mill can use things that otherwise would be wasted, such as tree-tops, damaged timber, and trees which have been removed in a thinning process. This would give the small timber owners a year round income from thinning operations and from the better trees for pulp and lumber. Before Southland was in operation they sold only saw lumber or poles and the tops and damaged trees were a complete loss. The large lumberman gained in the same way that the small timber holder did, he found a ready market for a lot of the wastage connected with the lumbering industry. On much of the timber acreage of the area, forestry and tree farming is now being employed. The trees are marked for cutting in relation to their best "end-use". In other words, whether it would be better as saw lumber or pulp timber. Where trees are cut, others are planted in their place. In addition, State and National cutting procedures, marking of trees and fire protection regulations are followed.[12]

The practibility of scientific thinning, cutting, and reforestation was proven even before Southland started operations. There had been an experiment underway at Crossett, Arkansas, for thirteen years when Southland came into the newsprint picture as a producing unit. In 1937 the following summary of the Crossett experiment was made:[13]

> The 440,000 acres of the Crossett limits are divided into ten units of 44,000 acres each. The program for the past ten years has been to lumber one unit each year so that in a cycle of ten years

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12 Lloyd G. Schenck, Personal Interview, Lufkin, Texas (May 31, 1951)

13 Albert Newcombe, Business Letter to Southland Paper Mills, (May 5, 1937).

FIGURE 2. TREE FARMS OF SOUTHERN YELLOW PINE

> the entire ten units have been lumbered and they would again start on the first unit.
>
> The Forestry Department and the Crossett Lumber Company claim that from their experience over the past ten years with this method of foresting, by proper thinning on this cycle program there is today more timber standing on their properties than existed when they started operations some thirty years ago.

With the feasibility of scientific tree farming and the idea of a cash crop being made of them, Southland soon brought a real-estate boom to the Lufkin, Texas, area. Cutover timberlands which had been almost worthless became valuable property. Kurth supplied millions of seedling pines, and at his urging the farmers began to turn poor, deteriorated cotton land back to timber.

In final analysis, a new and hitherto unused source of paper pulp which has but recently emerged from the experimental stage is Southern pine. While for some years past kraft wrapping paper had been made from the pulp of the Southern pine, it is only within recent years that a suitable white paper has been produced on a commercial basis. Newsprint of a good clear white color, light in weight, and with good tensile strength for running on fast newspaper presses is now an actuality. This accomplishment promises to bring to the Southern states a new industry and contribute much to the welfare and industrial progress of the South.

But Southern publishers, in the midst of 100,000,000 acres of pine forests, are still importing millions of tons of newsprint, most of it from Canada. Kurth thinks the South would now be supplying all its newsprint needs, had not World War II interfered. As it is, though, his enterprise inspired the opening of at least one other plant, at Coosa Pines, Alabama, which opened in January of 1950.[14] Others are sure to follow to the betterment of the South and the newsprint industry.

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14 Frank X. Tolbert, op. cit., pp. 32-33.

CHAPTER IV

LOCATION OF SOUTHLAND PAPER MILLS

The choice of a location for the Southland mill posed quite a problem to the men interested in inaugurating the newsprint industry in Texas. Naturally the mill would have to be located in such a place as to take full advantage of the necessary raw materials connected with the newsprint industry. In addition to this, the problems of labor, fuel, water, and transportation had to be considered. With these facts in mind, the original survey for the location of Southland took into consideration fourteen different communities in East Texas. The communities which were included in this original survey were:[1]

Beaumont (Jefferson Co.)
Conroe (Montgomery Co.)
Haslam (Center Co.)
Hemphill (Sabine Co.)
Jasper (Jasper Co.)
Jefferson (Marion Co.)
Liberty (Liberty Co.)
Livingston (Trinity Co.)
Lufkin (Angelina Co.)
Newton (Newton Co.)
Palestine (Anderson Co.)
San Augustine (San Augustine Co.)
Tatum (Rusk Co.)
Texas City (Galveston Co.)

After a thorough and exhaustive survey of these locations by Mr. George F. Hardy, it was decided that Lufkin was the more strategically located in relation to all the requirements necessary for the successful operation of the mill. Also taken into consideration was the possibility of expansion by

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1 The Development of Southland Paper Mills, Inc. (Organization booklet) p. 9.

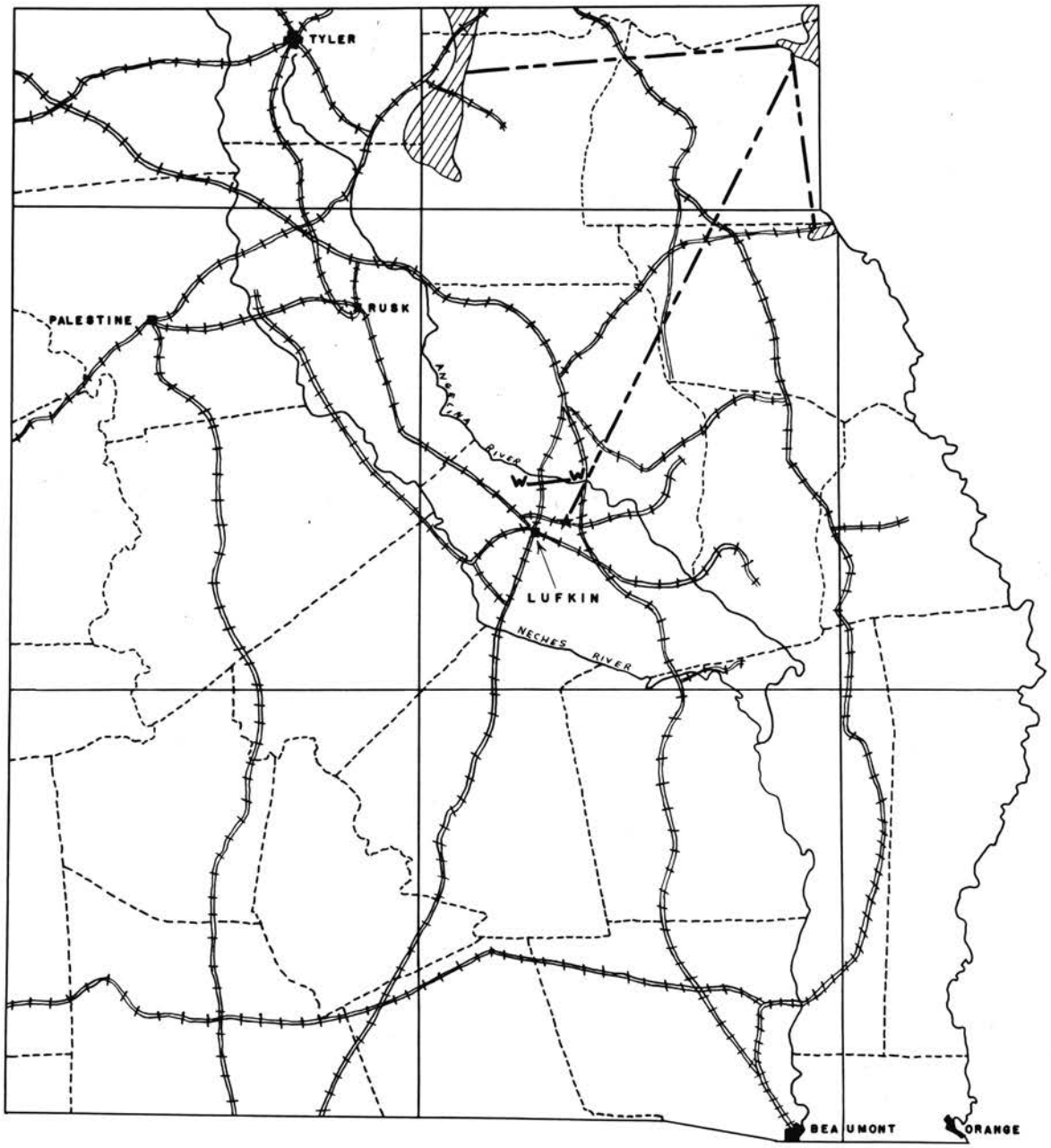
TYLER
PALESTINE
RUSK
ANGELINA RIVER
W
W
LUFKIN
NECHES RIVER
BEAUMONT
ORANGE
LOCATIONAL MAP
MILL SITE
GAS LINE
GAS FIELDS
WATER WELLS
RAILWAY LINES
FROM SOUTHLAND PAPER MILLS

FIGURE 3.

the mill at some future date. Again Lufkin received the deciding ballot.

Carrying, perhaps, as much weight as any one factor in the decision was the fact that Southland was able to purchase a share in a local lumber railroad. The site which was selected was conveniently situated directly on the Angelina and Neches River Railroad. This insured a short-haul making direct connections with two main-line railroads, the Cotton Belt and Southern Pacific. Most important, however, was the fact that by comparatively short extensions, direct connections could be made with two more main-line roads, the Santa Fe and the Missouri Pacific, a possibility which could conceivably be of extreme importance and value to Southland in any negotiations of difficulties regarding rates or services. Through the close cooperation of the stockholders of the Angelina and Neches River Railroad, the way was made clear for Southland to secure a one-half interest in this valuable connecting link.[2]

The exact site of the mill is actually outside the city of Lufkin. It was decided that the mill would be placed three miles east of Lufkin and just a little north. This point was chosen for several reasons. The Angelina and Neches River Railroad had an operating line at this point. Also at this point was a gas line from the East Texas oil fields. Another factor that was taken into consideration was the prevailing winds of the area. The choice of this site for the mill would not subject Lufkin to the unpleasant odors which are necessary in the chemical pulping at the mill.[3]

At Lufkin, in Angelina County, Texas, the mill is located in the midst of an extensive area of Southern pines. This forest occupies a belt which reaches through the Coastal Plain from extreme Southern Virginia to the

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2 The Development of Southland Paper Mills, Inc., Op. cit., p. 26.

3 C. C. Porter, Assistant to the Manager, Southland Paper Mills, Inc., Personal Interview, (May 29-June 2, 1951).

Everglades in Florida and the Trinity River in Texas. It is composed of ten different species of pine, of which the longleaf pine is the most abundant and occupies considerable area. This forest, besides furnishing a large part of the present timber cut of the United States, is a chief source of the naval stores for this country.

This region is one of heavy precipitation, ranging from forty to sixty inches and has a growing season from six to twelve months per year. The rapid evaporation and sandy soil has a tendency to make the vegetation of the area resemble, in many respects, the pure forests of Western yellow pine. The longleaf pine forest has the same open parklike character and the ground is covered with coarse grasses or low shrubs. The principal crops which are grown in this area are cotton, corn, peanuts, sweet potatoes, and velvet beans. At the present time, however, the trees themselves are considered as a crop by many of the inhabitants of the region.[4]

Angelina County, located within the heart of this vast pine belt, has an area of 857 square miles. The population density of Angelina County is 25-100 people per square mile and the population of the county is numbered at approximately 33,000 people.[5]

After due consideration, the Lufkin site was chosen as the most suitable. Geographic factors, requisite to the successful operation of a wood pulp and paper mill, were found to be at an optimum in this particular locality. It has proved so and there appears to be an opportunity for future growth.

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4 The Atlas of American Agriculture, p. 14.

5 Rand McNally Commercial Atlas and Marketing Guide, p. 405.

CHAPTER V

RAW MATERIALS USED IN NEWSPRINT

The chief raw material used in the newsprint industry is wood. The Southland mill draws upon the vast pine timber resources of East Texas. Although these forests are made up of a variety of pine trees, such as the slash, short leaf, long leaf and loblolly, they all fall into the general classification of Southern yellow pine. The longleaf, slash, and loblolly pines are usually found on low marshy lands of the Gulf Coastal Plain. The land is generally flat with deep sandy soil which is lacking in humus and is alternately wet and dry. The undergrowth consists of wire grass and palmetto.

The pure longleaf stands are usually thought of as being high pine land. This is a belt adjoining low marshy lands in the vicinity of the Gulf Coast. Here practically pure stands of longleaf pine cover the sandy hills and plains. The moist depressions bordering the creeks and streams of this area are usually occupied by hardwoods, loblolly pine, and cypress. Broom sedge, turkey oak and bluejacket oak form the undergrowth.

Longleaf pine, in mixture with shortleaf and loblolly pines and hardwoods, is found on the broken and hilly country lying still farther inland from the coast. Here the longleaf pine mingles with shortleaf pine forests and mixed hardwoods of the uplands.[1]

Many of the small timber holders of these regions are now practicing tree-farming on a scientific basis. Now in operation in Texas is the Texas Tree Farm System which is sponsored by the Texas Forestry Association, the East

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1 The Atlas of American Agriculture, p. 14.

Texas Chamber of Commerce, the Southern Pine Association, and the Texas Forest Service. This practice of tree-farming has also been encouraged by Southland as well as the kraft mills of the region.[2]

The logs used by Southland come from a variety of places and distances. The great bulk of the wood is cut within a fifty to sixty mile radius of the mill. However, under specialized operations, wood is brought in from far greater distances. In the case of sleet and wind storms which destroy the trees, the mill is able to utilize much of the timber which would otherwise be a complete loss as far as the lumbering industry is concerned. In regards to sleet storms, it might be well to mention that the slash pine is especially vulnerable to damage because of the long leaves which accumulate enough ice to break off the branches.[3]

The small producers do not sell directly to the mill, but contract through regular cutting agencies to have the logs extracted from their holdings. In this type of operation the contractor is in charge of the entire project of exploitation. He starts with the standing tree and ends his contract when the logs are in the woodyard at the mill. Although Southland owns approximately 130,000 acres of timber land, all of their logs are procured via the contract basis. At the present time the only cutting done on their forests is that which lends itself to the practice of good forestry, such as thinning and cutting of defective trees. Under the present plan of operation the Southland forests are being held in a reserve status and being improved constantly.[4]

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2 "Texans Practice Tree Farming." Texas Forest News, Volume XXX, (March-April 1951), p. 4.

3 C. C. Porter, Assistant to the Manager, Southland Paper Mills, Inc., Personal Interview, (May29-June 2, 1951).

4 Lloyd G. Schenck, Manager of the Lufkin Office of the Perkins-Goodwin Company, Personal Interview, (May 29-June 2, 1951).

Southland procured contracts with some of the large lumber companies of the area and thus did away with the necessity of dealing with a large number of smaller timberland owners. By these contracts they are permitted to use some of the logs and tops which are not satisfactory for the use of saw lumber. This procedure, as brought out before, is one of the supplementary aspects of a newsprint mill. Unless the mill was available to use the ordinary wastage of the lumbering industry, tons upon tons of pulpwood material representing many thousands of dollars would be lost annually. Before the mill was built a lot of this wood was burned or allowed to rot on the ground.

Selective cutting and thinning operations are also carried on in the National forests in the vicinity of Lufkin. Located within the fifty mile radius of Lufkin are two National forests, Crockett lying to the west and Angelina to the east. These two forests, which are controlled by the United States Forestry Service, had a combined total of 300,000 acres in 1938.[5]

Located within a seventy mile radius of Lufkin are two additional National forests, the Sam Houston and the Sabine. These two are also supervised by the United States Forestry Service and had a combined total of 332,000 acres according to the 1938 survey by the Southland Mills.[6] The selective thinning and cutting in these National forests is permitted only so long as it meets specifications of the Forestry Service and lends itself to good forestry practices.

There are two methods employed in bringing the logs to the mill. After the logs are cut into the desired lengths, they are loaded on trucks and hauled either to the mill or to the railroad. If they are sent to the railroad, they are loaded on flat cars or in box cars and continue their trip to

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5 Detailed Summary, Southland Paper Mills, Inc., Appendix II, Exhibit A.

6 Ibid., Appendix II, Exhibit A.

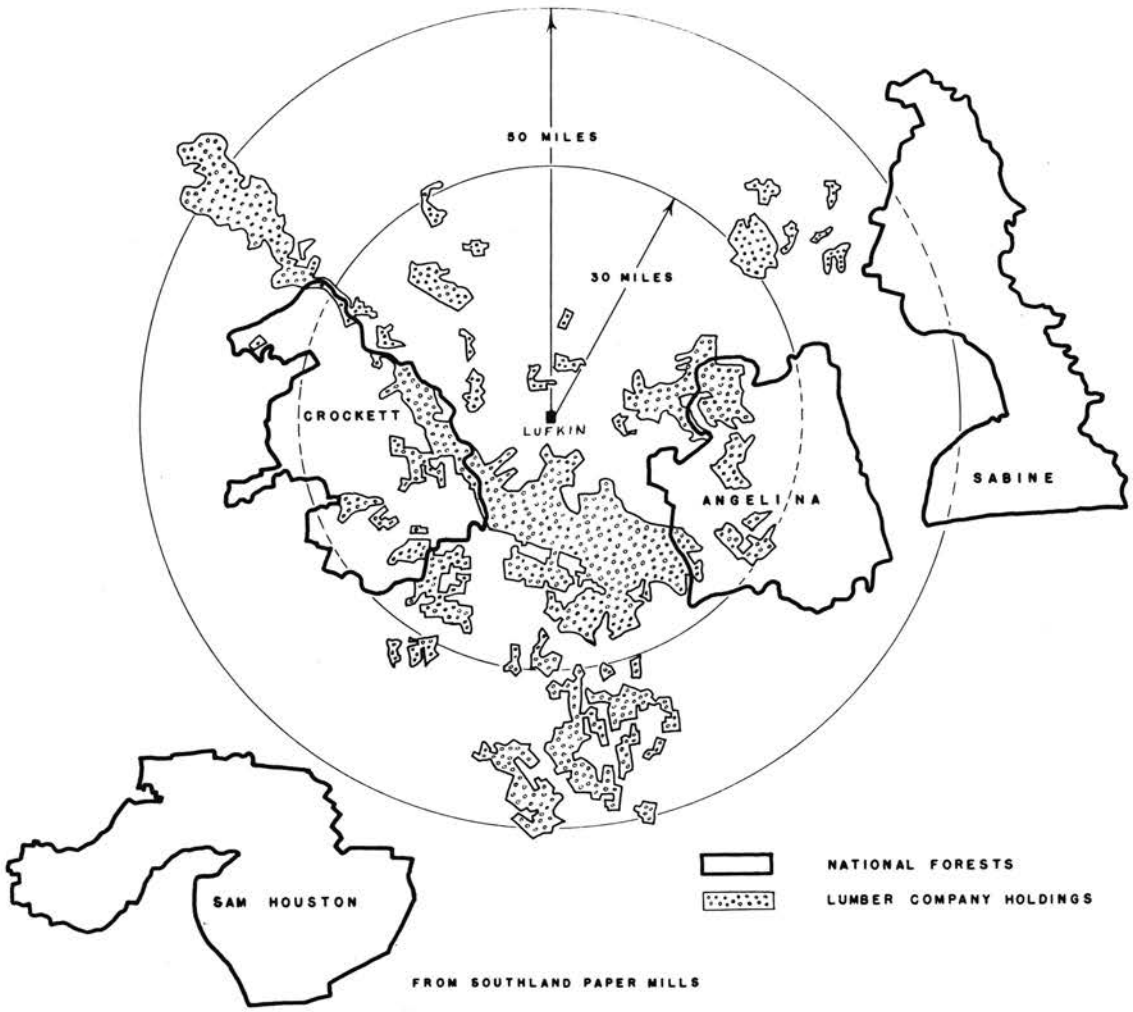

FIGURE 4. MAP OF FORESTS OF LUFKIN AREA

the mill by rail. The ideal log is one which is four or five feet in length and about six to ten inches in diameter. The logs which are four feet in length go to the mechanical grinders and the five foot logs go to the chippers to be prepared for the sulphate pulp. However, if a log is oversize, say fourteen to sixteen inches in diameter, it can still be used. These large logs are sent over a slasher where they are split before they go to the grinders or the chippers.[7]

Southland classifies water as a raw material. This is a very important ingredient and medium, as a newsprint mill uses vast quantities of water daily. The daily water consumption of Southland is 15,000,000 gallons. Of this amount, 13,500,000 gallons are discharged after use, the water loss at the mill being 1,500,000 gallons daily which is lost through the medium of steam and evaporation. However, the water is a recoverable raw material, and the water recirculated or moved is 200 time the initial intake.[8]

This water requirement is satisfied by the use of deep wells (drilled to the Carrizo and the Sparta sand with ten wells in each layer being able to furnish a total of 20,000,000 gallons per day.) which are located in Angelina and Nacogdoches Counties. To get an idea of the tremendous amount of water necessary for the operation of a newsprint mill, it is interesting to consider the amount of piping and mains required to handle it. The necessary piping and mains to move the 20,000,000 gallons of water per day would be 31,500 feet of connecting pipe and four miles of thirty-six inch mains.[9] It was necessary to drill the wells some distance from Lufkin because the waters in the immediate

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7 John Doe, Woodyard Foreman, Southland Paper Mills, Inc., Personal Interview, (May 29-June 2, 1951).

8 Porter, op. cit., Personal Interview.

9 Detailed Summary, Loc. cit.

environs are highly mineralized.

Other sources of water which were considered in the Southland surveys were the Angelina River and the Neches River. The water from the Angelina was perhaps a little better chemically and more desirable geographically than the water from the Neches River, but the final decision was for the deep water wells. The rivers and additional wells may be utilized in the future if it becomes necessary.

Some of all the remaining raw materials are procured in Texas, but Southland also imports chemicals from as far as California. The sodium sulphate used in the pulping process comes from Texas, Arkansas, and California. The caustic soda and chlorine are procured in Texas and Louisiana. A bleaching chemical serves the same purpose as bluing serves in the family wash, to whiten the finished newsprint. It is purchased where available, however, only very minute quantities of it are used.[10]

The fuel which is used in the Southland plant is natural gas obtained from the East Texas gas fields. The gas is used to produce steam power which in turn is used to generate electricity. The mill generates enough electricity to supply a city of 90,000 to 100,000 people with its electrical requirements. Part of the fuel used at the plant is "manufactured" at the plant itself. The bark and slivers which are removed from the logs in the debarking process are burned. The steam generated by the burning bark is used in two ways, part of it is used in the cooking process of the chemical pulp and part of it is utilized to generate electricity which is used to drive the motors on the mechanical pulp grinders. There are eight pairs of grinders and each pair is driven by a 4,000 horse power motor. This gives a total of 32,000 horse

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10 Porter, op. cit., Personal Interview.

power necessary to drive the sixteen grinding stones.[11]

Raw materials, such as wood, water, fuel and chemicals, are readily accessible to the Lufkin area. Only a small portion of the chemicals are procured outside the immediate trade territory. Hence, the fundamental basis for wood pulp and paper manufacturing is at hand for successful operation of a newsprint mill.

CHAPTER VI

PRODUCTION AND CONSUMPTION OF NEWSPRINT

The primary function of the Southland Paper Mills is the production of newsprint, although the mill does produce some paper board and pulp which are put on the market. Newsprint, however, outstrips, by far, both these products in tonnage produced and value of sales. Even during the years of World War II when the production of newsprint was curtailed by government restrictions and the production of board emphasized, newsprint still composed approximately seventy per cent of the total production of the Southland. At no time in Southland's history has the newsprint production of the Fourdrinier machines fallen below eighty per cent of the total volume. It was during the Second World War years that the Fourdrinier machines were utilized for the production of kraft pulp in the furtherance of the war effort. However, under ordinary conditions, newsprint will compose approximately ninety-seven per cent of the total Southland production.

The actual production of newsprint is carried on simultaneously by several inter-related processes. These processes will be discussed independently of each other so as to give a clear picture of the flow of the log from the woodyard to the finished sheet of paper.[1]

Production of Mechanical Pulp

Pine logs are brought into the woodyard from surrounding areas by truck and by rail. The logs are in four foot lengths, or in multiples of four feet which are slashed to the desired length. The logs which are brought in by

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1 Most of the following production activities were observed by the writer during his visit to the Southland Paper Mills, May 29-June 2, 1951.

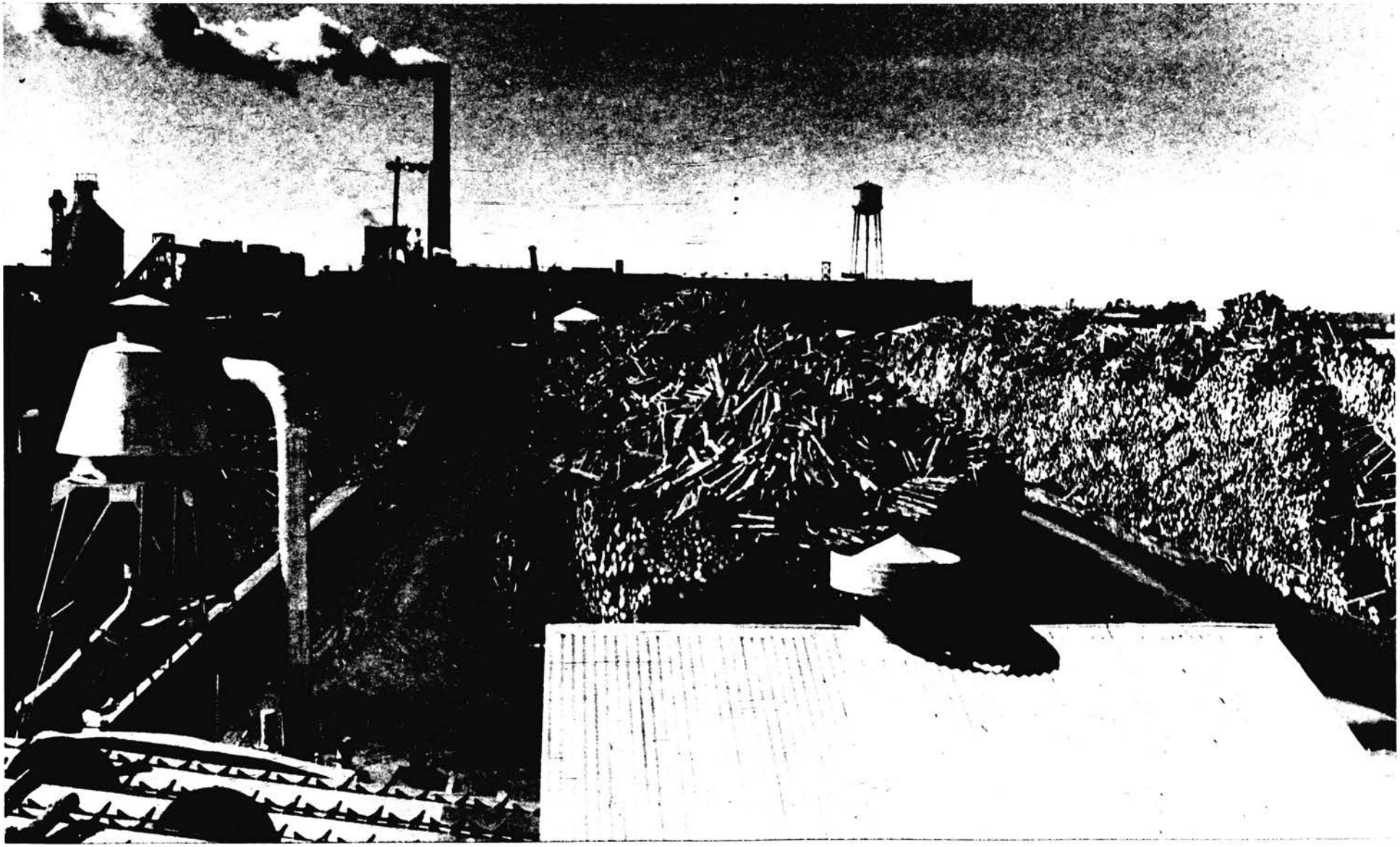

FIGURE 5. WOODYARD, SOUTHLAND PAPER MILLS

truck and by flatcar are stacked in the woodyard by the use of a crane, for later use. The woodyard contains immense stacks of such logs for use during an emergency. The logs which are brought in by boxcar are unloaded by hand and sent immediately to the barking drums by means of an endless belt.

The barking drums are two immense hollow cylinders into which the logs are fed by a conveyor. The barking drums have a circular motion to them and the bark is removed from the logs by the action of the logs scraping against each other as the cylinder turns. From the barking drums the logs are spilled onto a conveyor where they are separated by hand and selected as to the proper use. The best of the logs are put onto a different belt which carries them directly to the mechanical grinders. Logs which have not been completely debarked are put upon another conveyor that takes them back to the debarking drums. Those which are to be used for chemical pulp are left on the original belt and carried to the vertical chippers where rotating knives reduce the logs to small chips approximately the size of a postage stamp.[2]

As mentioned before, the best of the logs go directly to the mechanical grinder machines. The belt runs between the grinders. The machines are arranged so that they have four machines on each side of the belt and each of them contains two grinding stones. Each of these stones is capable of grinding twenty tons of logs per day. As the belt moves the logs along, they are pulled off manually and fed into the grinders. It requires a 4,000 horse power motor to turn each of these grinding machines, or for each pair of grinding stones.

It is interesting to note that the bark which was rubbed off in the debarking process is burned in order to create steam which is used in the manufacture of the electricity which is necessary to run these grinders. After

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2 R. C. Vinson, Salesman, Lufkin Office of the Perkins-Goodwin Company, Personal Interview, (May 29-June 2, 1951).

the logs are fed into the grinders, they are forced against the revolving stones by the use of hydraulic pressure feet. Water is employed inside the grinder casing for two reasons. The actual grinding process generates an excessive amount of heat and water is used as a cooling agent. Water is also used to force the ground-up logs (pulp) from the machine into a trough which is located underneath the grinders. The pulp is then run over a series of coarse screens by the application of water. As it is washed over these coarse screens, the unground slivers are removed. These slivers, which are rejected from the groundwood process, are collected and shipped to Shreveport, Louisiana. At Shreveport these slivers are used in the manufacture of composition roofing shingles.[3]

From this point the thin pulp, "slurry," as the mixture of ground fibre and water is called, is pumped through rotating screens which further remove small dirt specks and fine slivers. As the pulp slurry must be very thin to accomplish this, it is rethickened after screening. The rethickening process is done by the use of large rotary vacuum filters which drain the excess water away. By doing this they are able to store reasonably large amounts of thickened pulp in relatively small tile chests located underneath the thickner.[4]

Stock preparation is the next step in the manufacture of newsprint. It is at this point in the manufacturing process that the bleached kraft chemical pulp is added to the mechanical pulp. The approximate amounts of blended pulp are eighty per cent mechanical and twenty per cent chemical. Also at this point other ingredients are added, depending upon the quality and type

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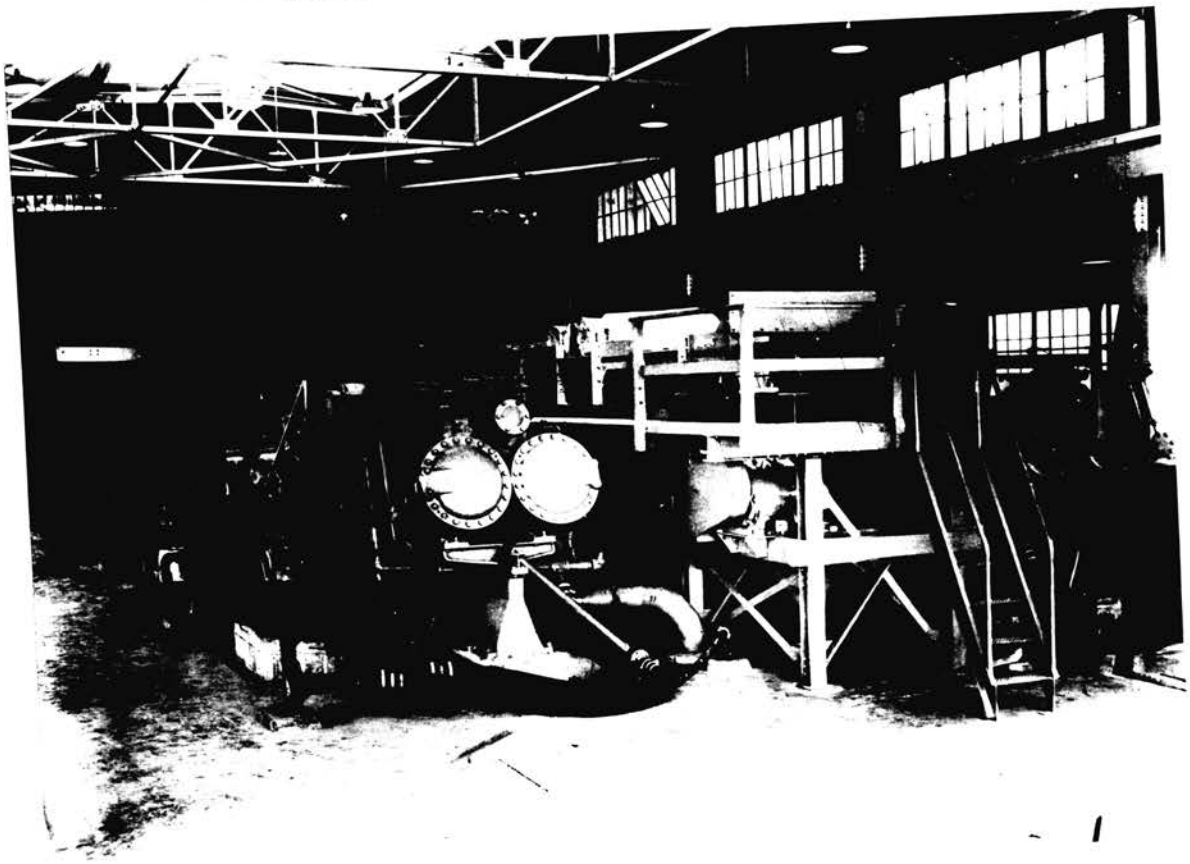
3 Cary Trevathan, Assistant Manager, Lufkin Office of the Perkins-Goodwin Company, Personal Interview, (May 29-June 2, 1951).

4 History of Southland's Development, Southland Paper Mills, Inc., (Organization Pamphlet).

FIGURE 6. BARKING DRUM (BCV-) AND GRINDERS (BC[illegible]), SOUTHERN [illegible] MILLS.



of paper desired, such as a small amount of bluing. The mixed pulp from which the newsprint is manufactured is now ready for the final process, the actual formation of a sheet of newsprint.

The Fourdrinier machine, where the pulp is actually formed into a sheet of paper, consists essentially of an endless wire cloth, some nineteen feet wide, supported by appropriate rollers and driven by an electric motor which moves the wire at a speed of approximately 1,300 feet per minute. The slurry, which has been properly mixed in the stock preparation, is allowed to flow onto this moving wire cloth from a headbox after it has been diluted with water to a very thin consistency. The wire cloth is fixed in such a manner that it forms an endless belt and as the wire moves, the water drains through holes in it. As the water drains out, this leaves the wood fibres meshed into a homogeneous mat. Underneath the wire are flat-boxes with perforated tops which are connected to large vacuum pumps which further aid in removing the excessive water from the mat of fibers. In addition to the flat-boxes are rolls with perforated shells which are also connected to the vacuum pumps. Their purpose is the same as that of the flat-boxes, the draining off of excessive water through the medium of suction applied by the vacuum pumps. At the wet end of the endless wire cloth in the headbox, the amount of water that has been mixed with each ton of dry fiber is 48,000 gallons. At the dry end of the wire cloth, this amount has been reduced to 960 gallons by draining and by suction.[5]

It is at this point that the sheet of paper starts its journey without having to be supported. In other words, it is strong enough to be transferred from one set of rollers to another without a supporting belt. When it leaves the endless wire cloth, the sheet passes between two sets of presser rollers

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5 History of Southland's Development, op. cit., p. 17.

where additional moisture is pressed from the sheet into woolen felts. These presser rolls are made of polished granite.

The next step in the process is the drying section. The sheet is passed alternately over and under large, steam-heated cylinders. It is here that all of the moisture which is removed from the paper is evaporated. The dryer section is composed of forty-eight of these dryers.

From the drying section the sheet goes to the "calender stack". The calender stack is composed of eight steel rollers, one on top of the other. These rollers are free rolling and rely on their own weight to complete the last step prior to the actual winding of the rolls of paper. As the sheet passes through this set of rollers it is reduced in thickness by about one-half, and a smooth finish is imparted to the paper. The process is practically identical to the smoothing of textiles with an ordinary hand iron.

From the calender stack the sheet moves to the winding reel where it is wound to the desired size. After a large enough reel is wound up, the moving sheet is transferred to another reel without any interruption of the process. The reel is then moved to the rewinding machine and the paper is rewound and cut to the customer's specifications. This is done in one operation by the placing of knives at the proper spaces across the roll as it is being rewound.[6] After each section of the roll has been wrapped and weighed, the finished product is ready for shipment to the various newspapers with whom Southland has contracts for newsprint.

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6 Robert Hamner, Backtender, Southland Paper Mills, Inc., Personal Interview, (May 29-June 2, 1951).

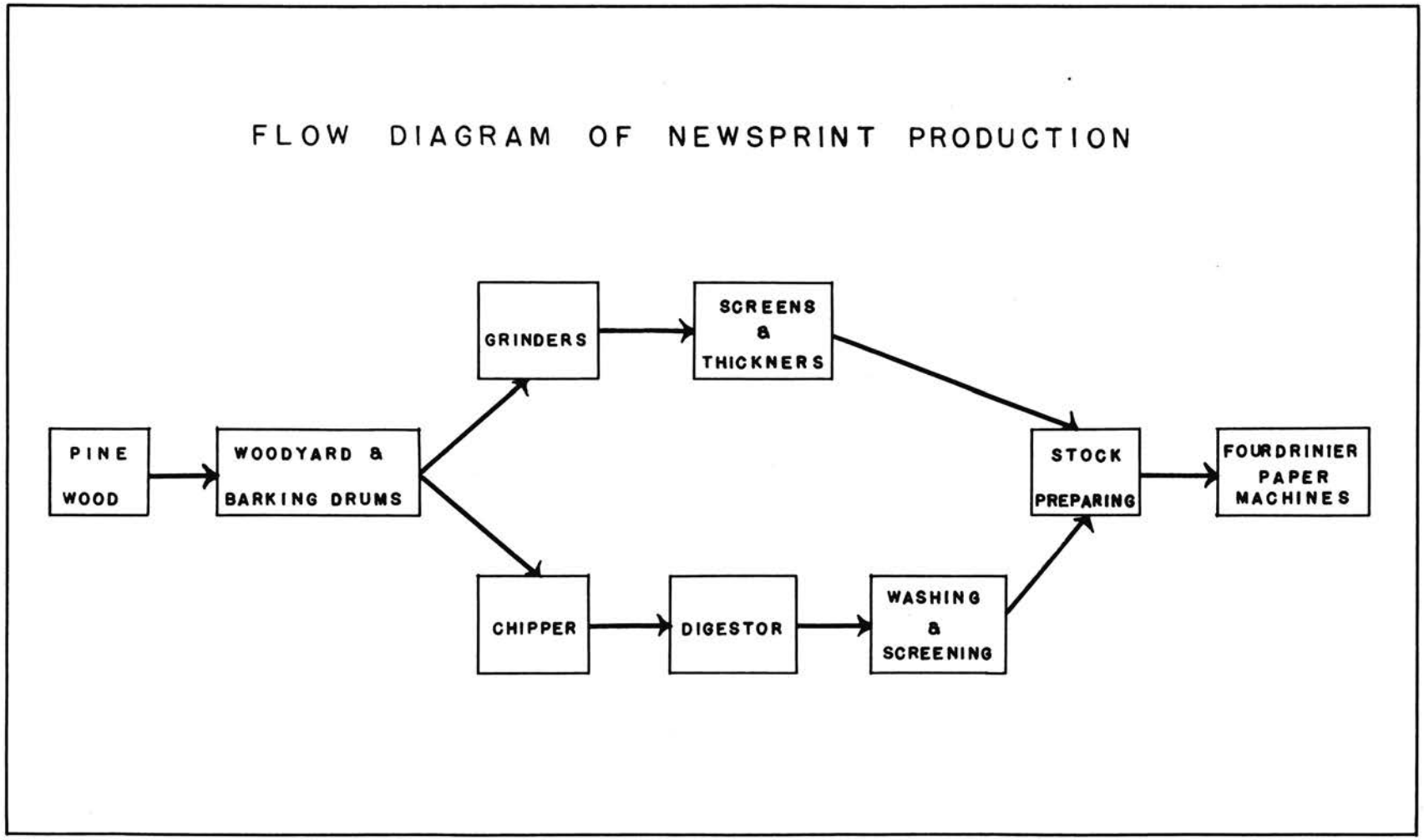
FLOW DIAGRAM OF NEWSPRINT PRODUCTION
PINE WOOD
WOODYARD & BARKING DRUMS
GRINDERS
SCREENS & THICKNERS
CHIPPER
DIGESTOR
WASHING & SCREENING
STOCK PREPARING
FOURDRINIER PAPER MACHINES

FIGURE 7.

Production of Kraft Pulp

After the logs have gone through the vertical chippers and reduced to fine chips, they are stored in a large vertical tank resembling a water tower such as may be found in most small cities. From this storage tank the chips are fed, by means of a vibrator, onto a long rubber conveyor belt, which in turn loads the chips into the digestors. These digestors are large steel pressure vessels operating on the same principle as a pressure cooker. It is within these digestors that the wood chips are reduced to pulp. Each one is four stories high and holds chips equivalent to about sixteen cords of wood. After the digestor is loaded, a cooking liquor, consisting of a solution of caustic soda and sodium sulphide, is poured in over the chips. After the top of this vessel is bolted in place, live steam is admitted into the bottom of the digestor and the entire charge is cooked approximately two hours. The steam used in this cooking process is derived from the burning of the bark which was removed from the logs in the debarking process. The cooking action dissolves the cementing materials present in the wood which hold the individual fibers together. This cementing material consists mostly of lignin, while the desired wood fibers are essentially pure cellulose. Upon completion of the cooking a valve in the bottom of the digestor is opened, whereupon the internal pressure expels the whole mass through a pipe line into an outside storage tank.[7]

The cooked pulp is pumped from the storage tank onto a series of rotary vacuum washers. The washers are constructed with a wire cloth facing and the pulp is fed in upon this screen facing. As the pulp is screened, the spent liquor drains through the wire and is collected in storage tanks. The spent

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7 C. C. Porter, Assistant to the Manager, Southland Paper Mills, Inc., Personal Interview, (May 29-June 2, 1951).

liquor is recovered and used over again. There are three such washers, one after the other and each washer washes the pulp progressively cleaner.

The washed stock from the last washer drops into a tile storage chest where it is diluted to a thin slurry of water and passed through rotary screens which screen out the small slivers and uncooked chips. From this point, the washed and screened pulp is split two ways, part going to the stock preparation department for future delivery to the cylinder machine, and the other part to the bleach plant where the pulp is bleached white for use in newsprint.

The unbleached kraft pulp passes through a paddle-type meter and drops into a pump in the basement floor at which point it is mixed with chlorine gas to start the initial bleach. The pump forces the chlorinated pulp up through a tile tower to allow retention time for the chemical reaction induced by the chlorine gas. The pulp leaving this tower is pumped to a rubber-covered washer where some of the coloring compounds are washed out. The pulp leaving this washer is mixed with caustic soda and is pumped up through a retention tower similar to the first operation. A second washer removes more of the color compounds.

The final bleach is affected by mixing this washed pulp with sodium hydrochlorite (Chlorox) and dumping it in the top of a large tower. The final bleached pulp is withdrawn from the bottom of this tower and washed once more. In some cases where a very white bleach is required, an additional bleach with more sodium hydrochlorite is made. The bleached pulp is moved to the Fourdriniers for newsprint and to the cylinder machine for the manufacture of bleached Kraft boards.[8]

At the present time, sulphate pulp comprises twenty-two per cent of the pulp which is used in the manufacture of Southland newsprint. Sulphate pulping

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8 Vinson, op. cit., Personal Interview.

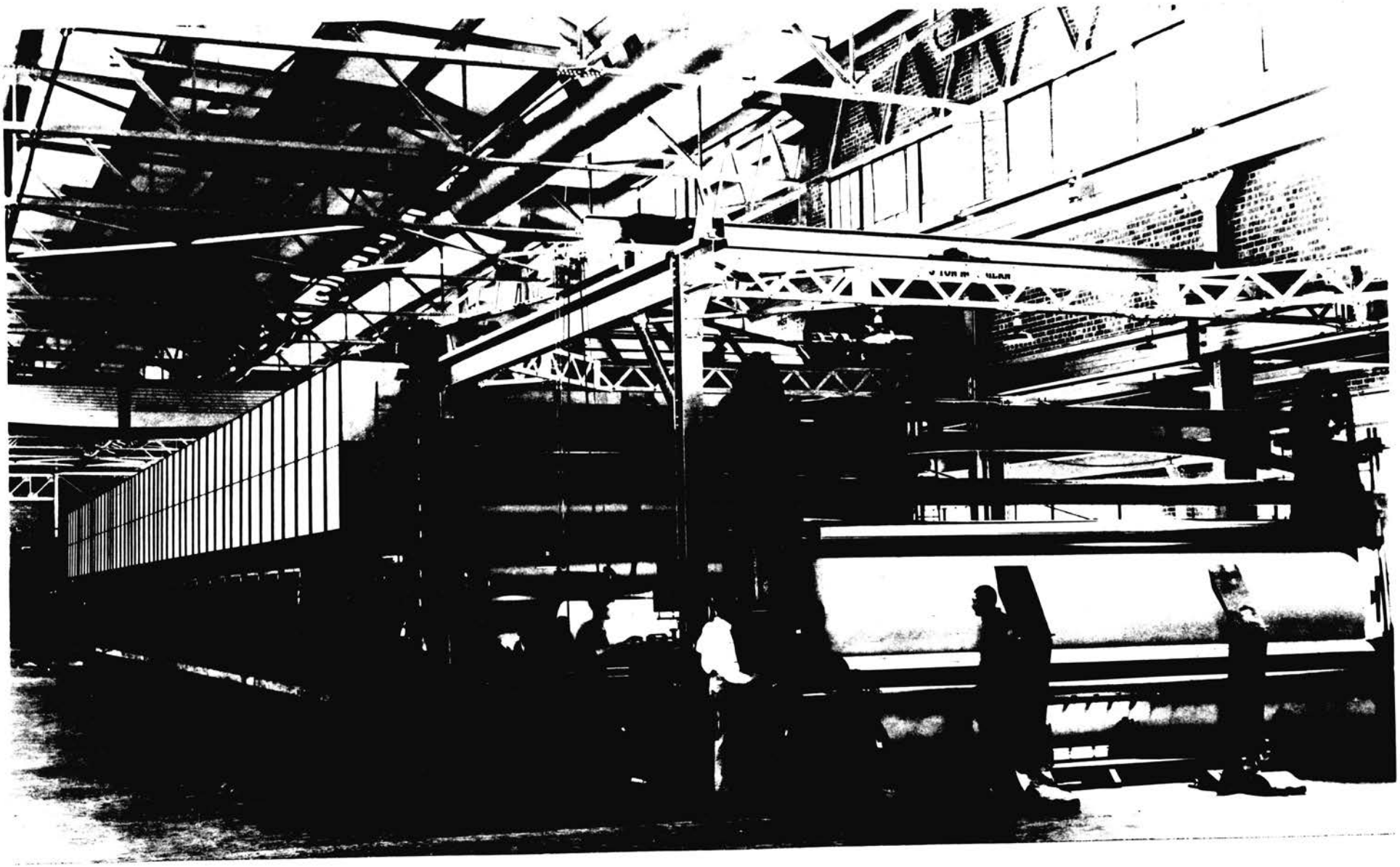

FIGURE 8. TOURNIER NEWSPRINT MACHIN

uses considerably more wood than mechanical pulping. It requires two cords of wood to make a ton of bleached sulphate pulp but only nine-tenths of a cord to make a ton of groundwood pulp.

The number of cords of wood used daily will vary from time to time, but Southland usually processes from 650 to 700 cords of wood per day. When the mill started operations in 1940 this wood could be obtained for only $5.00 per cord, but the cost has risen to $14.00 per cord which is the cost at the present time. The daily output or production of newsprint at Southland is about 375 short tons. They have achieved a rather high efficiency in the production of their newsprint. At present it takes only 100.8 pounds of pulp to produce 100 pounds of newsprint.[9]

The following is a resume of the total Southland shipments from 1940 through 1950:[10]

Table IV

Southland Shipments from 1940 through 1950

Shipments	Per cent	Tons
Newsprint	70	706,553
Other Fourdrinier Prod.	5	54,137
Pulp (M.D. & Wet Lap)	14	153,151
Cylinder Machine Board	10	102,004
Culls, Side runs and Broke	11	10,718
Total	100	1,016,563

This total of production and shipments represents a value of approximately 85,000,000 dollars.

As stated previously, newsprint mills use a cylinder machine to utilize some of the materials which are not satisfactory for the production of newsprint. This serves as a supplemental income and also to cut down waste.

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9 Porter, op. cit., Personal Interview.

10 Summary of Sales and Statistics, Loc. Cit.

The production of Southland's one cylinder machine for the years 1944 through 1950 is as follows:[11]

Table V

Southland Cylinder Machine Production by Years and Products[12]

Year	M.D.Pulp	Wet Lap	Board
1944	30,741	4,091	25
1945	30,287	7,785	4,834
1946	11,897	11,256	16,122
1947	9,229	12,972	21,819
1948	7,492	7,859	17,775
1949	2,768	1,906	17,559
1950	- - -	4,727	23,870
Total	92,413	50,596	102,004

The total production of Southland for all products, from both the cylinder and two Fourdrinier machines, amounted to 158,609 tons for the year 1950. The breakdown of this total by products is listed below:[13]

Table VI

Total Southland Production for Year 1950

Product	Tons
Newsprint	
Domestic	122,618
Foreign	7,389
Total newsprint	130,007
Pulp-Kraft	
M. D. Unbleached	- - -
Wet Lap- Unbleached	4,549
Wet Lap- Semi-bleached	178
Total--Kraft pulp	4,727
Other Products	
Board--Cylinder Machine	23,875
Total, All Products	158,609

In order to get a clear picture of the relative importance of Southland

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11 Summary of Sales and Statistics, Loc. Cit.

12 Refers to machine dried pulp.

13 Summary of Sales and Statistics, Loc. Cit.

in the newsprint industry, it might be well to consider their production in relation to the production of the United States and of the North American continent.[14] The comparison will be from the year 1940 through 1950.

Table VII

Newsprint Production of the United States and Southland, 1940 through 1950[15]

Year	United States	Southland	Total
1940	1,013,437	28,989	4,784,825
1941	1,014,912	40,902	4,785,577
1942	952,616	46,665	4,407,144
1943	804,853	50,066	4,023,857
1944	719,802	45,723	3,984,383
1945	724,448	46,288	4,316,349
1946	770,890	48,941	5,276,953
1947	825,554	53,435	5,645,718
1948	867,494	93,347	5,850,328
1949	899,528	124,190	6,075,855
1950	1,003,597	130,007	6,282,182

The above table shows that Southland's importance in the newsprint field is increasing each year. Southland production has made up most of the United States increase for the ten year period. Even though, the total United States output is not keeping pace with its Canadian counterpart.

During the ten years that Southland has been in production, a small percentage of the Fourdrinier production was utilized for products other than newsprint. This production was 57,306 tons and represented seven per cent of the total production. This production consisted of specialty products such as wrapping papers and converting papers, during years when, because of Government restrictions, inventories, etc., publishers were unable to take full contract commitments. Except for that, all salable Fourdrinier production has always gone to its contract customers. Also during these years a

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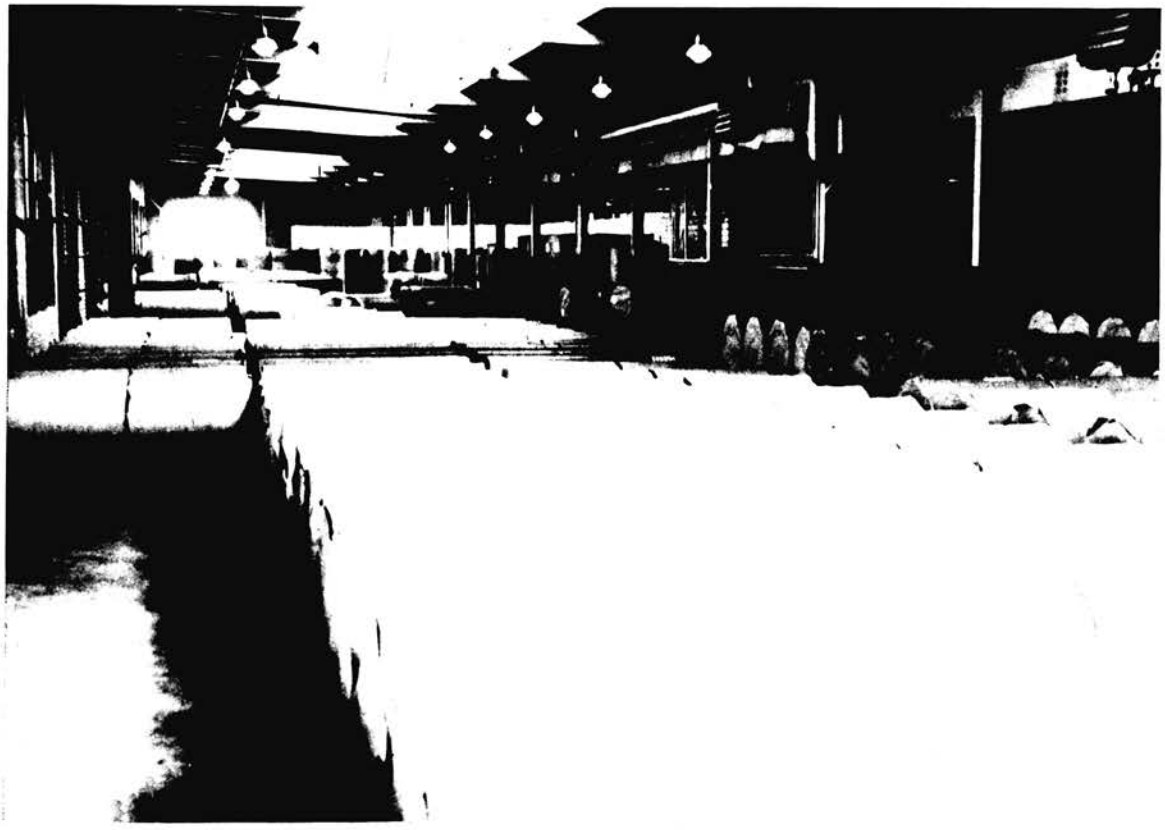
14 Summary of Sales and Statistics, Loc. Cit.

15 The total is for all North American production and includes Newfoundland and Canada.

PHOTO 9. CENTER STACK (BOW) AND BOILER ROOM (BELOW).



very small amount of newsprint was sold to Mexican papers.[16]

The per cent of the yearly production of the Fourdrinier machines which was utilized for these other products during the past decade are listed below:[17]

Table VIII

Production of Fourdrinier Machines other than Newsprint Production

Year	Per Cent
1940	0
1941	13
1942	10
1943	5
1944	13
1945	20
1946	16
1947	12
1948	6
1949	2
1950	0
Average	7 Per cent per year

The consumption of Southland newsprint, with the exception of a very limited amount which was exported to Mexico, is relegated to a four state area which includes Texas, Oklahoma, Arkansas, and Louisiana. The customers in this area are all contract customers, as Southland does not put any of its newsprint on the open market. Selling strictly on this basis, Southland supplied approximately 14 per cent of the newsprint consumed in this four state area in 1940. By 1950 the per cent of Southland newsprint consumed had risen to 36.2 per cent of the total consumption of this region.

The percentage and tonnage of total newsprint consumption supplied by

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16 Lloyd G. Schenck, Manager, Lufkin Office of the Perkins-Goodwin Company, Personal Interview, (May 29-June ?, 1951).

17 Summary of Sales and Statistics, Loc. Cit.

Southland in their distribution area during representative years of 1940, 1945, and 1950 is as follows:[18]

Table IX

Per Cent and Tonnage of Total Newsprint Consumption Supplied by Southland in their Trade Area

Total Consumption	Arkansas	Louisiana	Oklahoma	Texas
1940	7,983	32,525	26,600	89,263
1945	10,012	32,132	22,334	96,428
1950	18,040	60,779	46,473	196,507
Southland Shipments				
1940	1,965	1,110	7,350	10,555
1945	2,502	2,065	7,000	22,049
1950	6,151	6,520	28,065	78,288
Per Cent Supplied by Southland				
1940	25	3	28	12
1945	25	6	31	23
1950	34	11	60	40

The transportation of the finished material, or rolls of paper, is all by rail. The rolls are loaded at the mill by means of mechanical power trucks. They are picked up and carried to the car and deposited in place without ever having been touched by hand. By means of these mechanical loaders, one box-car can be completely loaded in eighteen to twenty minutes. During World War II some of the paper was transported by means of trucks, but trucking is more costly and used only as an emergency nature.[19]

The following chart will give some idea of the relative position of Southland in the total consumption of newsprint by buyers in the United States.[20]

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18 Summary of Sales and Statistics, Loc. Cit.

19 Schenck, op. cit., Personal Interview.

20 Summary of Sales and Statistics, Loc. Cit.

Table X

Newsprint Sales Comparisons Between 1940 and 1950

Newsprint Production and Shipments	January 1940	December 1950
Total all North American Mills	4,784,825 tons	6,282,182 tons
North American Production Increase, 1950 over 1940	- - - -	31 %
Operating Ratio (All No. American Mills) % Capacity	82.5 %	101 %
Southland Newsprint Shipments	26,989 tons	130,007 tons
Newsprint Consumption		
Total United States Consumption	3,709,028 tons	5,936,941 tons
United States Consumption Increase 1950 over 1940	- - - -	60 %
Southland Area Consumption, (Tex., La., Ark., Okla.)	156,351 tons	321,799 tons
Southland Area Consumption Increase 1950 over 1940	- - - -	106 %
Per Cent of Total Consumption in Four State Area Supplied by Southland	14 %	37 %

It is interesting to note that during this same period the total United States consumption increased sixty per cent while the total production, which is all of North America including Newfoundland and Canada, increased only thirty-one per cent. This should speak well for the future possibilities of expansion of Southland and for the possibility of other newsprint mills being erected in the South.

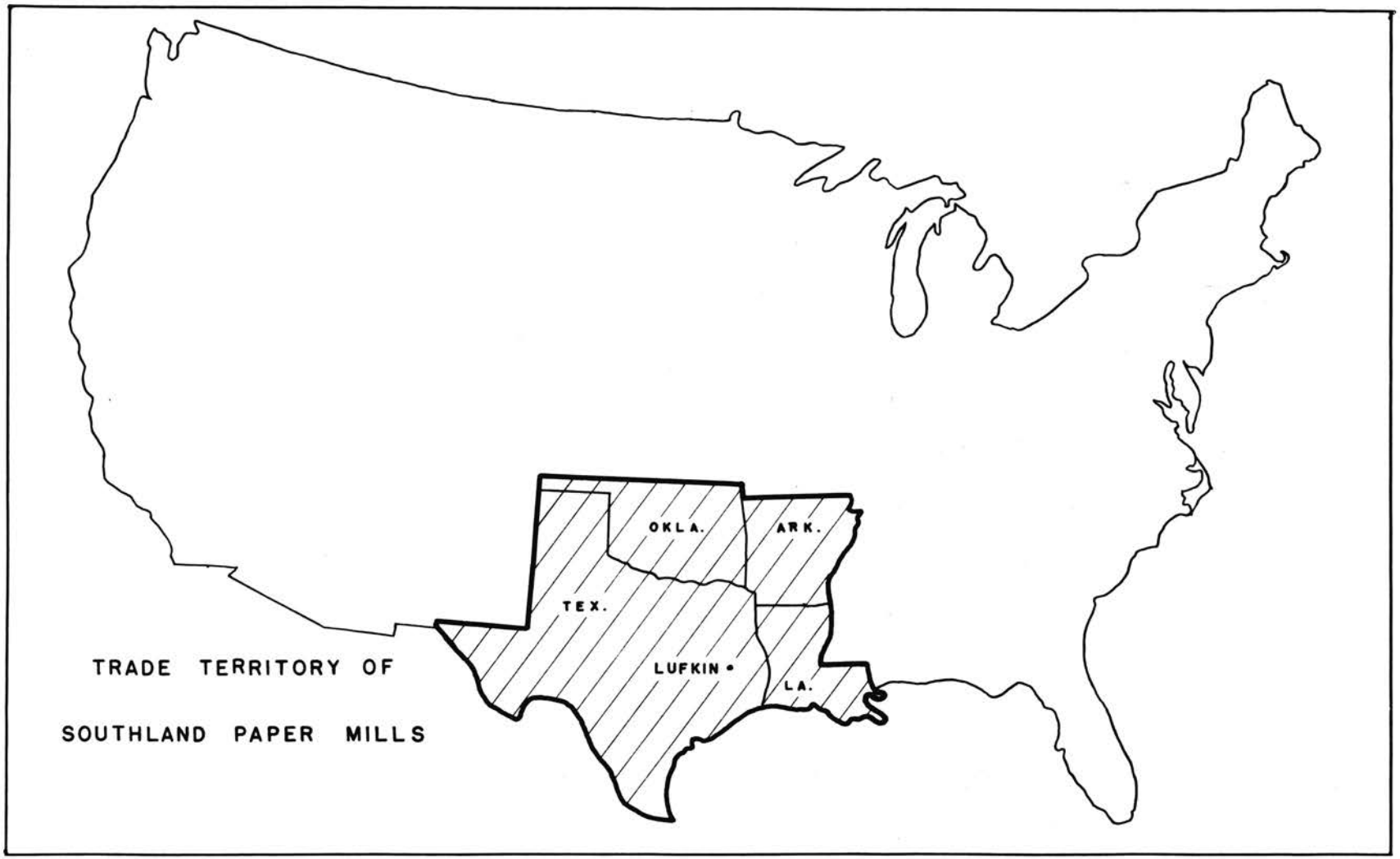
OKLA.
ARK.
TEX.
LUFKIN
LA.
TRADE TERRITORY OF
SOUTHLAND PAPER MILLS

FIGURE 10.

CHAPTER VII

FUTURE OF SOUTHLAND PAPER MILLS

In considering the future possibilities of Southland, it might be well to consult some comparative figures concerning the production and consumption of newsprint for the past decade, from 1940 to 1950.[1]

Table XI

North American Mill Production vs. United States Consumption

North American Mill Production			United States Newsprint Consumption	
Year	Operating % Ratio	% Increase Over Preceding Year	Pounds per Capita	% Increase Over Preceding Year
1940	82.5	16.4	56.2	4.6
1941	82.7	.02	58.7	3.2
1942	74.8	7.0*	56.4	3.8*
1943	70.5	8.3*	53.5	4.0*
1944	69.2	2.0*	47.1	13.6*
1945	76.4	7.3	49.8	4.4
1946	96.3	23.4	60.8	27.7
1947	101.3	7.3	66.3	13.7
1948	102.-	3.7	70.4	12.5
1949	101.4	3.9	74.1	6.2
1950	101.-	3.4	78.4	6.7

* Figures with an asterisk show a decrease rather than an increase over the previous year.

From the above chart it is observed that although the production on the North American continent has been steadily increasing, with the exception of the years during World War II, the consumption has been increasing at a more rapid rate than has the production. Even with the available mills operating at 100 per cent capacity they are unable to keep up with the consumption increase. This would seem to indicate that either new mills should be

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1 Summary of Sales and Statistics, 1940-50, Southland Paper Mills (1951).

constructed or facilities of existing mills should be expanded.

At the present time Southland is in a good position to enlarge its productive capacity. Although the Company is already supplying ten per cent of the United States production it cannot meet all the needs of its own trade territory, the four state area of Texas, Oklahoma, Arkansas, and Louisiana. Even if Southland does not wish to sell newsprint outside of their territory, the demand for it within the four state area is sufficient to warrant expansion. In the year 1950 they supplied only about thirty-seven per cent of the total newsprint consumption of their area. This represented an increase of almost twenty-three per cent over the year 1940. With favorable freight rates within their area it is feasible that they should be successful in capturing a larger percentage of the market in the future.

In one sense of the word, the Canadian producers are assisting Southland in gaining stronger control. Our northern neighbor is finding new markets for its newsprint, and cutting down on exports to the United States. The United States, therefore, must boost its own production.[2]

Another factor to take into consideration is the psychology of the men who are instrumental in forming the policy which governs Southland's operations. As already witnessed, they are men of sound judgement and vision. These men built with an eye to the future and an idea of expansion. Ernest Kurth thinks the pulp industry will make cotton a secondary crop in the South. It is his belief that pines can be grown twice as rapidly as at present, and with reasonable conservation of the forests, the newsprint industry can go on forever.

As yet, there is no competition for the timber which is used by both the

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2 Frank X. Tolbert, "Paper Prophet." Colliers, (April 28, 1951), pp. 32-33.

kraft and newsprint industries as well as the lumbering concerns which are located in the South. As part of their long range program, Southland is improving and expanding their timber holdings. In 1950 the company bought an additional 14,046 acres of timberland which brought their total acreage to 137,445 acres. The bulk of the wood used, however, was purchased from timber owners in the vicinity of Lufkin and less than 500 cords of wood were harvested from Southland's own timber holdings. The company is now engaged in a long range forestry improvement program and within ten years should be growing 125,000 cords of wood annually. This long range improvement of their own timber resources coupled with the campaign being carried on by the state and national forest interests for the conservation and improvement of the existing forests would seem to assure an ample supply of wood for any future expansion that Southland might wish to undertake.

Newsprint from Southern yellow pine is now an accepted product and the raising of money for any future expansion would not be nearly so difficult as it was when Southland was first formed. The skepticism with which financial interests first viewed Southland would no longer be prevalent. The undertaking has proven to be a successful venture.

Apparently there is an ample supply of water to service any future expansion. The wells which supply the present needs of the mill are not being fully utilized at this time. In the future if more water was needed, Southland would have a choice of drilling more water wells or of procuring additional water from the Angelina or Neches Rivers. The water from the rivers would need some processing, but it is still an available source to be considered. So, water seems to pose no barrier to the expansion of Southland.

Southland's present source of fuel is sufficient for operation and for any expansion they may contemplate in the future. The East Texas gas fields

would be able to handle any new demands for gas which the newsprint industry might impose. However, in the event that, because of some technicality, they would not be able to supply enough natural gas, there are millions of tons of peat in Eastern Texas which could be utilized, or coal could be secured from Southeastern Oklahoma.

At the present time, labor constitutes no problem for Southland and it would seem that the future requirements would be met successfully. In regards to labor supply, there are several factors to be considered. Lufkin is located in an area that is pine product conscious. The whole economy of the area revolves around the pine forests located there. Local labor would be more apt to remain and work there than to move out, and as long as Southland is in an advantageous position to bid for this service of labor, they will be successful in supplying their own needs. Within the last year, two plants in the North have suspended operations which put certain technical men in the surplus category in northern United States. Southland was successful in inducing some technicians to accept positions with them when yellow pine newsprint was only a possibility, and it seems highly probable that many of these men would accept positions in the South now that southern newsprint is a successful commercial enterprise. So, in the event that local labor would not meet future requirements, because of the mobility of labor, technicians could be imported from the North.

Taking all things into consideration it would seem that the future of Southland is very secure and the possibilities for expansion are excellent. The rapid growth of trees, of course, is the fundamental consideration since the process has developed to be economically sound.

APPENDIX I

PAPER TESTING[1]

BASIS WEIGHT. By this term is meant the weight of a ream of paper of a given size and number of sheets. For newsprint it is 480 sheets measuring twenty-four by thirty-six inches.

THICKNESS. The thickness of paper is usually measured with a micrometer in which a single sheet is held under a given pressure.

SMOOTHNESS. The "printing smoothness" of a sheet of paper is generally assumed to be correlated with, and measured by, the rate of flow of air between the paper and a plate pressed on its surface. This test appears to indicate fairly well the printing characteristics of news and similar papers of realtively coarse surface.

STRENGTH. (Tensile) The tensile breaking strength of paper is the load required to pull a strip of it apart. Tensile strength is often expressed as the "breaking length", which is the length of a strip of the paper which, if suspended at one end would break of its own weight.

(Bursting) In making this test the paper is usually clamped beneath a metal ring which holds it firmly while pressure is applied underneath until the paper bursts.

(Tearing) The paper is clamped in two fixed jaws and a slit is made by means of a knife attached to the instrument. A pendulum is then released and in its swing tears the paper. A pointer indicates on a scale the force required.

1 Edwin Sutermeister, Chemistry of Pulp and Paper, pp. 450-463.

APPENDIX II

THE LOCATION AND PRODUCTION CAPACITY OF THE UNITED STATES NEWSPRINT MILLS [1]

Company and Mill Location	Newsprint Capacity Short Tons 1950	1951
Cossa River Newsprint Co., Coosa Pines, Alabama	100,000	100,000
Inland Empire Paper Co., Millwood, Washington	20,000	20,000
Pejepscot Paper Company, Brunswick, Maine	35,000	32,000
Publishers Paper Company, Oregon City, Oregon	75,000	75,000
St. Croix Paper Co., Woodland, Maine	80,600	88,000
Southland Paper Mills, Inc., Lufkin, Texas	120,000	130,000
West Tacoma Newsprint Co., Steilacoom, Washington	22,000	26,000
Crown Zellerbach Corp. Group:		
Crown Zellerbach Corp., West Linn, Oregon	38,000	40,000
Crown Zellerbach Corp., Port Angeles, Washington	135,000	146,000
Total Crown Zellerbach Group	173,000	186,000
Great Northern Paper Group:		
Great Northern Paper Company, Millinocket, Maine	248,700	262,650
Great Northern Paper Company, East Millinocket, Maine	93,000	95,790
Total Great Northern Group	341,700	358,440
Total as reported to ANPA by individual Mills	967,300	1,015,440
Total U.S. capacity reported by Newsprint Service Bureau	992,000	1,050,000

1 Summary of Sales and Statistics, 1940-1950, Southland Paper Mills, 1951.

APPENDIX III

Chronology of Paper and Related Topics[1]

A.D.

105 During the period of Chien-ch'u, Ts'ai Lun was made one of the Imperial Guard. Later Ho Ti Appointed him privy councillor and it was during this reign that Ts'ai Lun, A.D. 105, announced the invention of papermaking to the Emperor. The paper was made from mulberry and other barks, fish nets, hemp and rags.

150 Paper dating from this period found in the Great Wall of China by Sir Aurel Stein. Made from rags.

450 General use of paper in Eastern Turkestan, replacing all other materials for calligraphy. The paper was made from rags and barks, with improvements in sizing with pastes made from grains.

650 Earliest use of paper in Samarkand, the paper imported from China, the world's most highly developed Empire.

751 In this year paper was made in Samarkand, the first place outside China to understand the secrets of the craft, revealed by Chinese prisoners of war.

793 Paper fabricated for the first time in Baghdad, introduced by Harun-al-Rashid, who acquired skilled artisans from China for the purpose.

800 Earliest use of paper in Egypt, probably imported from Samarkand or Egypt.

875 Arab travellers in China report having seen toilet paper in use in that country during the ninth century.

950 Earliest use of paper in Spain.

1035 About this time waste paper was repulped and again used as material for papermaking.

1100 The earliest instance of papermaking in Morocco, having been introduced from Egypt.

1102 Earliest use of true paper in Sicily.

1151 A stamping-mill for the maceration of rags for papermaking was put in operation in Zativa, Spain. This type mill was adopted from the Orient.

1276 First mention of the Fabriano, Italy, paper mill.

1309 First use of paper in England.

1 Dard Hunter, Paper Making: The History and Technique of an Ancient Craft, pp. 464-584.

1390 First paper mill in Germany, established by Ulman Stromer, Nurnberg. Before the commencement of this mill the paper used in Germany was imported from Italy. The first recorded labor strike in the paper industry took place in the Stromer mill.

1450-5 Johann Gutenberg's 42-line Bible produced. The beginning of book-printing in Europe and the commencement of the use of paper on a comparatively large scale. The paper used in the printing of this Bible has never been excelled for durability and remains to this day a monument to the papermaking craft.

1495 First paper mill established in England, by John Tate, in Hertfordshire. The first printer to make use of Tate paper was Wynken de Worde in the English edition of Bartholomaeus: De proprietatibus rerum, 1496.

1588 John Spielman, a German, one of the goldsmiths to Queen Elizabeth, established a paper mill in Dartford, Kent, England. In 1589 Spielman was granted a patent which gave him a monopoly in the collecting of rags and the making of paper in the Kingdom.

1609 The earliest newspaper with regular publication dates, Avisa Relation oder Zeitung, published in Germany. The first English newspaper was issued in London in 1622. The earliest Russian newspaper appeared in 1703.

1636 England visited by a plague thought to have been brought into the country through linen and cotton rags imported by the papermakers.

1666 To save linen and cotton for the papermakers a decree was issued in England prohibiting the use of these materials for the burial of the dead; only wool could be used for this purpose. In England at this time 200,000 pounds of linen and cotton were saved annually in this manner.

1678 William Rittenhouse, who established the first paper mill in America, was working as a papermaker in Amsterdam, Holland, at this time.

1704 The Boston News Letter established in Boston by John Campbell, the earliest permanent newspaper in America.

1719 Establishment of American Weekly Mercury, Philadelphia, the first newspaper in Pennsylvania.

1761 On December 2 was born in Paris Nicholas-Louis Robert, the inventor in 1798 of the paper-machine.

1774 Karl Wilhelm Scheele, a Swedish chemist, discovered chlorine, which was in later years used in the bleaching of paper stock.

1776 By this year linen and cotton rags for papermaking had become so scarce that the Massachusetts General Court appointed a Committee of Safety in each locality to encourage the saving of rags. So great was the need for paper in America at this time that legislation obtained exemption from military service for all skilled papermakers. This same exemption prevailed in 1812.

1777 The earliest treatise on papermaking materials appeared in the New World, issued in Philadelphia.

1784 First complete book to be printed in Europe on paper made from material other than linen and cotton. The paper was manufactured from an admixture of grass, lime-tree bark, and other vegetable fibres. France.

1798 The paper-machine invented by Nicholas-Louis Robert, a Frenchman. The small, undeveloped machine was set up in the Essonnes paper mill and the French government granted Robert a fifteen-year patent and advanced money for the perfection of the machine. Aside from the models made by Robert little was accomplished in France and it was not until a number of years later that a really practical machine was built in England by John Gamble and Bryan Donkin.

1800 Matthias Koops, living in London, began his experiments in the use of wood, straw, and the de-inking of paper. Three books were compiled by Koops using these materials for the paper upon which they were printed. The greater part of the present-day paper industry is founded upon the pioneer work of Koops.

1802 Probably the earliest use of bleached wood-pulp paper in English book production. The book, an edition of The Mathematical and Philosophical Works, to which is prefixed the Author's life, was printed in London.

1806 The name Fourdrinier appears for the first time in relation to the paper-machine now bearing this well-known appellation. A patent dated July 24, 1806, was taken out by Henry Fourdrinier.

1809 John Dickinson, an English papermaker, invented and patented the cylinder paper-machine.

1810 It was probably this date before the Fourdrinier paper-machine reached any degree of perfection, after patient work by John Gamble and Bryan Donkin. It was not until 1812, however, that the machine was started on a thorough commercial basis.

1816 By act of congress of April 26 a thirty-per-cent duty was placed on all imports of paper into the United States. By 1820 there was being made in this country $3,000,000 worth of paper; by 1830 the volume had risen to $7,000,000.

1817 First paper-machine erected in America, a cylinder machine operated in the mill of Thomas Gilpin, near Philadelphia. The machine was based on the Dickinson principle (see 1809). The first newspaper to make use of the Gilpin machine-made product was Poulson's Daily Advertiser, Philadelphia. The original machine did the work of ten vats of the hand-made mills.

1821 First important book to be printed on American machine-made paper manufactured on the Gilpin cylinder machine. Philadelphia.

1827 First Fourdrinier paper-machine set up in America, built in England by Bryan Donkin. The machine was put in operation at Saugerties, New York, in the mill of Henry Barclay.

1828 Second Fourdrinier paper-machine in America installed in the mill of Joseph Pickering, North Windham, Connecticut.

On August 8 Nicholar-Louis Robert, the French inventor of the paper-machine, died in Vernouillet, France, a poorly paid school-teacher.

1829 First Fourdrinier papermaking machine to be built in America made in South Windham, Connecticut, and installed in the mill of Amos Hubbard, Norwich Falls, Connecticut.

1830 Bleach invented by Scheele in 1774, first used by American papermakers in bleaching rags for making paper.

1840 Friedrich Gottlob Keller, a German weaver of Saxony, procured a German patent for a wood-grinding machine. Keller's work was no doubt based on the practical experiments that Matthias Koops carried on in England as early as 1800.

1841 Charles Fenerty, a Nova Scotian, produced in Halifax the first ground-wood paper made in the Western Hemisphere.

1846 Only two handmade-paper mills remained in the United States.

1851 First useful paper made from chemical wood fibre originated by Hugh Burgess and Charles Watt. The process was patented in the United States in 1854.

1852 Ground-wood pulp produced regularly in the mill of H. Voelter's Sons in Heidenheim; also in a mill in Giersdorf, Silesia. A small percentage of rag fibres was used to give the paper strength.

1854 John Beardsley, Buffalo, New York, submitted to a local newspaper three specimens of paper he had made from basswood.

1856 By this year the consumption of paper in the United States had reached a point where it equalled that of England and France combined. The newspapers of New York City required 12,000 tons of paper for the year, and by 1864 newsprint had reached the price of twenty-eight cents a pound.

1857 Experiments in the sulphite process for the preparation of wood fibre for papermaking begun in Paris.

1859 On July 4 was published in New York the world's largest newspaper, the sheet measuring 70 by 100 inches, with thirteen columns to the page. Only one copy of this paper is recorded.

1860 As late as this date rags formed 88 per cent of the total papermaking material.

1863 The Boston Weekly Journal for January 14 printed on paper made from wood-pulp. It is stated editorially that the entire edition of the Journal for January 15 was printed on "paper made of wood, a new process."

1865 Between this date and 1885 a larger number of patents relating to papermaking were issued by the United States Patent Office than had ever been known in the history of any country.

1866 First ground-wood pulp mill in Canada, the Buntin mill at Valleyfield; the material, maple blocks.

The Willcox mill of Pennsylvania ceased making paper by hand, the last of America's handmade-paper mills except two revivals that did not continue long in operation.

1867 Albrecht Pagenstecher, Massachusetts, established the first ground-wood mill in the United States.

1868 The New Yorker Staats-Zeitung in its editions of January 7, 8, and 9 was printed on American newsprint made from ground-wood pulp, the first New York City newspaper to use paper made of this material.

1880 The first ground-wood pulp produced on the Pacific Coast. Astoria, Oregon.

1882 Sulphite pulp first made in the United States on a commercial scale. Providence, Rhode Island.

1884 Sulphate pulp invented by Carl F. Dahl.

1886 In The Manufacture of Paper, by Charles Thomas Davis, there are listed more than 950 materials from which paper could be made.

1887 The largest paper-machine in the United States at this time was in the Hudson River Company mill. The wire was 112 inches wide and 50 feet long. The machine was operated at 250 feet per minute.

1889 For the first time in the United States paper-production exceeded 1,000,000 tons per annum.

1896 Electricity used in papermaking for the first time in the United States, Niagara Falls, New York.

1899 Production of paper in the United States was 2,167,593 tons, with 22 per cent of the machines idle.

1909 First kraft paper manufactured in the United States.

1915 During this year the students of the New York State College of Forestry, planted seedlings of the red pine; a number of years later they harvested the wood and made it into pulp and finally into newsprint, in the school laboratory. The paper manufactured was used in printing the student newspaper of the college.

1920 Paper was made at a speed of 1,000 feet a minute on a Fourdrinier machine on October 23, 1920.

1921 First use of Alabama spruce pine for making paper on a commercial scale. The Birmingham Age-Herald, June 20, 1921, was printed on paper made from this pulp. After testing claimed it was equal to paper made from Canadian spruce.

1940 Production of paper in the United States, 14,372,000 tons, with 14 per cent of the machines idle.

1942 Newsprint to the amount of 8,971,000 tons produced in the world, Canada making two-fifths of this. In the United States alone newspaper sales were 44,492,836 copies each day.

1945 It is stated that there are 14,000 different paper products.

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